APPENDIX 6.1

NRA/TII Criteria for Rating the Magnitude and Significance of Hydrogeological Impacts at EIA Stage National Roads Authority

NRA/TII, 2009

Table 1 Criteria for rating Site Attributes - Estimation of Importance of Hydrogeology Attributes (NRA)

Magnitude of Impact	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Source: Box 4.3: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)

Table 2 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeology Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run- off. [1] Calculated risk of serious pollution incident >2% annually. [2]
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. [1] Calculated risk of serious pollution incident >1% annually. [2]
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run- off. [1] Calculated risk of serious pollution incident >0.5% annually. [2]
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually. [2]

1 refer to Annex 1, Method C, Annex 1 of HA216/06
2 refer to Appendix B3 / Annex 1, Method D, Annex 1 of HA216/06

Source: Box 5.3: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)

Table 3 Rating of Significant Environmental Impacts at EIA Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

Source: Box 5.4: Guidelines on Procedures for Assessment and Treatment of Geology for National Road Schemes' by the National Roads Authority (NRA, 2009)

APPENDIX 6.2

Stage 2 Flood Risk Assessment

Punch Consulting Engineers

PUNCH
consulting engineers

Parkway Valley LRD

Site Specific Flood Risk Assessment
231171-PUNCH-XX-XX-RP-C-0002

May 2026

Document Control

Document Number: 231171-PUNCH-XX-XX-RP-C-0003

Status	Rev	Description	Date	Prepared	Checked	Approved
A0	C01	Planning Issue	06/05/2026	A. O'Gorman	T. O'Connell	J. Tiernan

Table of Contents

1 Introduction

1.1 Background

PUNCH Consulting Engineers was appointed by Kirkland Investments Ltd to carry out a Site-Specific Flood Risk Assessment (SSFRA) for a proposed development in Parkway Valley in Limerick City.

The assessment is carried out in full compliance with the requirements of "The Planning System & Flood Risk Management Guidelines" published by the Department of the Environment, Heritage and Local Government in November 2009 and Limerick Development Plan (LDP).

Reddy Architecture has developed a set of architectural drawings outlining the proposed works. The scheme comprises five multistorey residential blocks (A, B, C, D, E) for 403 No. 1-bed and 2-bed apartment units. In addition, the development includes a creche at ground level within Block B and a medical centre located at the entrance into the development.

1.2 Existing Site

The site is a brownfield site and is approximately 5.65 hectares in area. It is bounded by the Dublin Road to the north, Parkway Valley commercial shops and residential to the east and southeast. The site is surrounded by greenfield to the other boundaries. Construction works were carried out on the site previously but were never completed. The previous development was a proposed mixed-use development comprised of an RC and streel frame. A retaining wall has been retained along the western boundary, but the remainder of the site has been demolished and the site has a gravel footprint as of now.

The location of the site is shown in Figure 1-1.

Figure 1-1: Location of the Proposed development (indicative site boundary outlined in red)

1.3 Nature of the Proposed Development

The proposed LRD development comprises 5 no. blocks with a total of 403 no. residential units, ranging from 5 to 8 storeys in height; a medical centre located at the western edge of the site; a creche located at ground level within Block B; and all associated site works and development.

The current LRD development proposals also extend to the R445 to accommodate a proposed entrance from the R445. They will also include a proposed nature based surface water drainage solution within the neighbouring Groody Valley green wedge.

Specifically, the proposed uses for the LRD development are:

Medical Centre

A c. 3,082sq. m, 4-storey over podium level medical centre is proposed to be located at the western extent of the application site.

Creche

A c. 306 sq. m creche is proposed on the lower ground floor level of Block B.

Residential Development

The subject proposals will provide a total of 403 no. units comprising of 246 No. 1 Bed units, 29 No. 2 Bed (3 person) units and 128 No. 2 Bed (4 person) units.

The proposed works are outlined in a series of architectural drawings prepared by Reddy Architecture and engineering drawings prepared by PUNCH Consulting Engineers and supplied as part of the planning documentation.

An extract from the site layout is included in Figure 1-2.

Figure 1-2: Proposed Site Layout

2 Relevant Guidance

2.1 The Planning System and Flood Risk Management Guidelines

In September 2008, "The Planning System and Flood Risk Management" Guidelines were published by the Department of the Environment, Heritage and Local Government in Draft Format. In November 2009, the adopted version of the document was published.

The Flood Risk Management Guidelines give guidance on flood risk and development. The guidelines recommend a precautionary approach when considering flood risk management in the planning system. The core principle of the guidelines is to adopt a flood risk sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for river and coastal flooding. The guidelines include definitions of Flood Zones A, B and C, as noted in Table 2-1 below. It should be noted that these do not take into account the presence of flood defences, as there remain risks of overtopping and breach of the defences.

Table 2-1: Flood Zone Designation

Flood Zone	Type of Flooding	Annual Exceedance Probability (AEP)
Flood Zone A	Coastal	Less than a 1:200 (0.5% AEP) year event
	Fluvial	Less than a 1:100 (1% AEP) year event
Flood Zone B	Coastal	Greater than a 1:200 (0.5% AEP) and less than a 1:1000 (0.1% AEP) year event
	Fluvial	Greater than a 1:100 (1% AEP) and less than a 1:1000 (0.1% AEP) year event
Flood Zone C	Coastal	Greater than a 1:1000 (0.1% AEP) year event
	Fluvial	Greater than a 1:1000 (0.1% AEP) year event

Once a flood zone has been identified, the guidelines set out the different types of development appropriate to each zone. Exceptions to the restriction of development due to potential flood risks are provided for through the use of the Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. This recognises that there will be a need for future development in existing towns and urban centres that lie within flood risk zones, and that the avoidance of all future development in these areas would be unsustainable.

A three staged approach to undertaking an FRA is recommended:

Stage 1: Flood Risk Identification - Identification of any issues relating to the site that will require further investigation through a Flood Risk Assessment;

Stage 2: Initial Flood Risk Assessment - Involves establishment of the sources of flooding, the extent of the flood risk, potential impacts of the development and possible mitigation measures;

Stage 3: Detailed Flood Risk Assessment - Assess flood risk issues in sufficient detail to provide quantitative appraisal of potential flood risk of the development, impacts of the flooding elsewhere and the effectiveness of any proposed mitigation measures.

This report addresses the requirements for Stage 2.

2.2 Limerick Development Plan 2022 - 2028

The subject site is located within the lands covered by the Limerick Development Plan (LDP) 2022-2028 with the core flooding objectives as follows:

1. Avoid inappropriate development in areas at risk of flooding;
2. Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
3. Ensure effective management of residual risks for development permitted in floodplains;
4. Avoid unnecessary restriction of national, regional or local economic and social growth;
5. Improve the understanding of flood risk among relevant stakeholders; and
6. Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

2.3 Land Zoning

The land on which the main elements of the development proposed is currently zoned as "Mixed use" in the LDP 2022-2028. See extract below in Figure 2-1 from Map 3 of the LDP 2022-2028, Volume 2a.

The proposed development is in accordance with this land zoning.

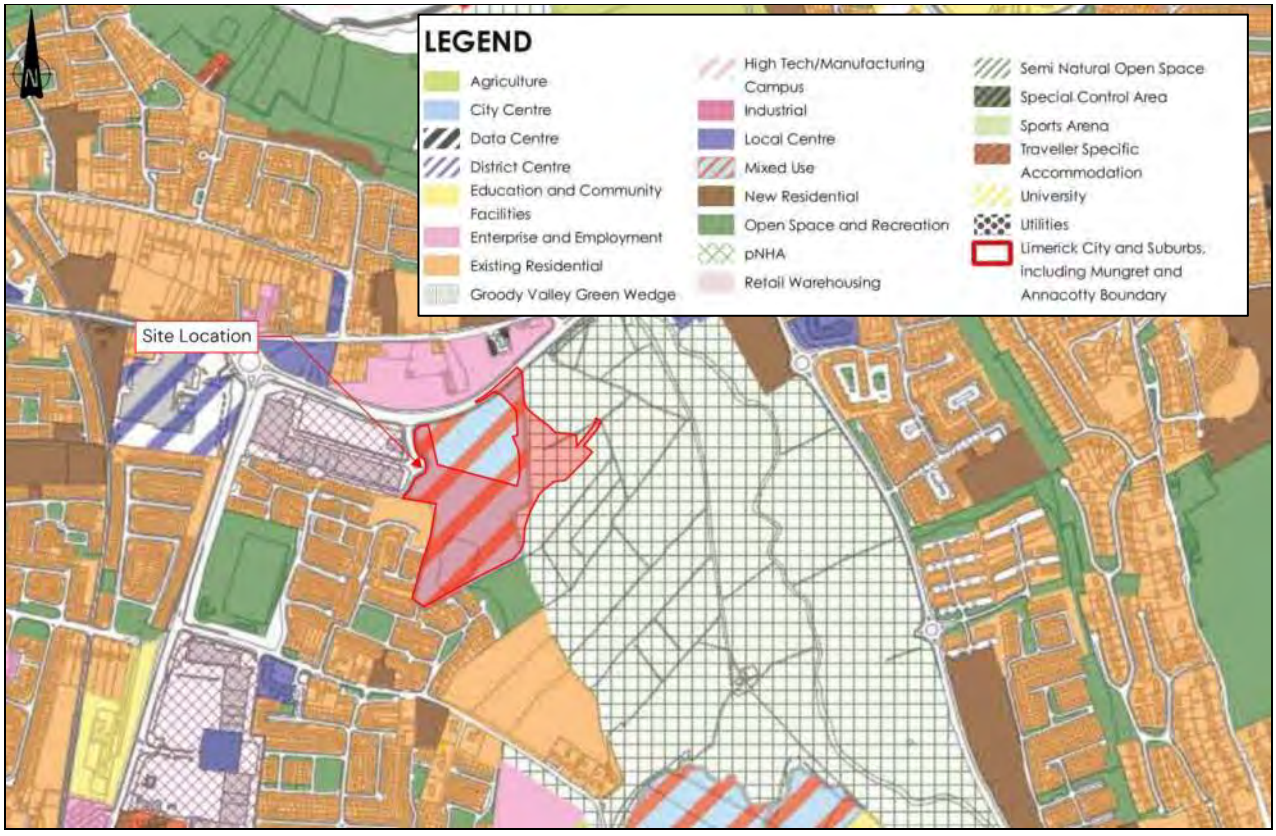


Figure 2-1: Land Use Zoning (Extract from Limerick DP 2022-2028, Volume 2a)

2.4 Flood Risk Management Plan

The OPW publish Flood Risk Management Plans detailing the feasible range of flood risk management measures proposed for their respective river basins. The Flood Risk Management Plan for the Shannon Estuary South River Basin was published by the OPW in 19/02/2018 and is valid for the period 2018-2021. A new FRMP hasn't be published for this area and as a result this FRMP is the most up to date plan and remains valid for this area. The plan lists current flood management measures in place and potentially viable Flood Relief Works.

The proposed development area will benefit from the Limerick City and Environs Flood Relief Scheme which is currently at the design stage. The OPW states that Limerick City & County Council have commissioned RPS Consulting Engineers to develop a flood relief scheme for Limerick City and its environs.

> *"The objective of the scheme is to alleviate the risk of flooding to the Community of Limerick City and environs by providing a scheme that is technically, socially, environmentally and economically acceptable."*

A review of the Limerick City and Environs area commenced in 2021 as part of the Flood Relief Scheme as an error was identified in the Flood Map source data. This is currently at post consultation stage. Feedback received during the consultation period will be considered and updated final flood maps will be published as soon as they become available.

3 Flood Risk Identification

3.1 Existing Hydrological Environment

The existing hydrological environment is characterised primarily by the presence of the Groody River which is located approximately 335m east of the proposed site. There is also an OPW arterial drainage channel to the east of the site. The hydrological environment around the site is shown in Figure 3-1 below.

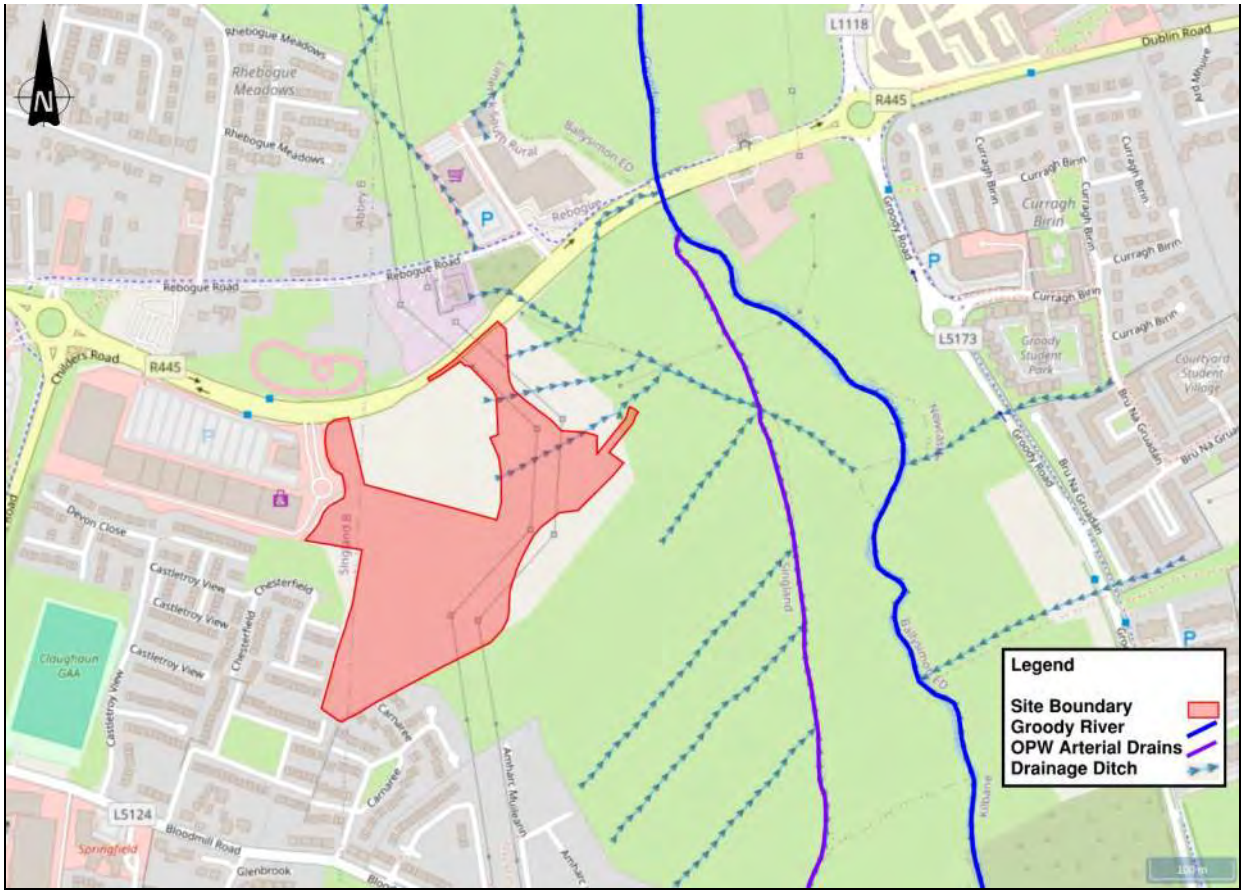


Figure 3-1: Hydrological Environment around the site

3.2 Topographical Survey

A topographical survey of the site and its environs was completed by Control Surveys on the 10th of March 2023. As shown in Figure 1-2, the site is bounded by the Dublin Road to the north, Parkway Retail Park to the northeast and greenfield to the south and west.

The survey shows that, while there are some localised raised areas surrounding the site, existing ground levels on the site are generally flat and range from 8.4 to 9.64mAOD.

The site has a gravel ramp in the northeast corner which connects the low-level ground to the level of the surrounding roads. The also shows some low-level ponding which is retained by a short retaining wall roughly a metre in height.

The topographical survey extent is shown in Figure 3-2. Refer to image below for an indication of the site topography along the Dublin Road boundary.

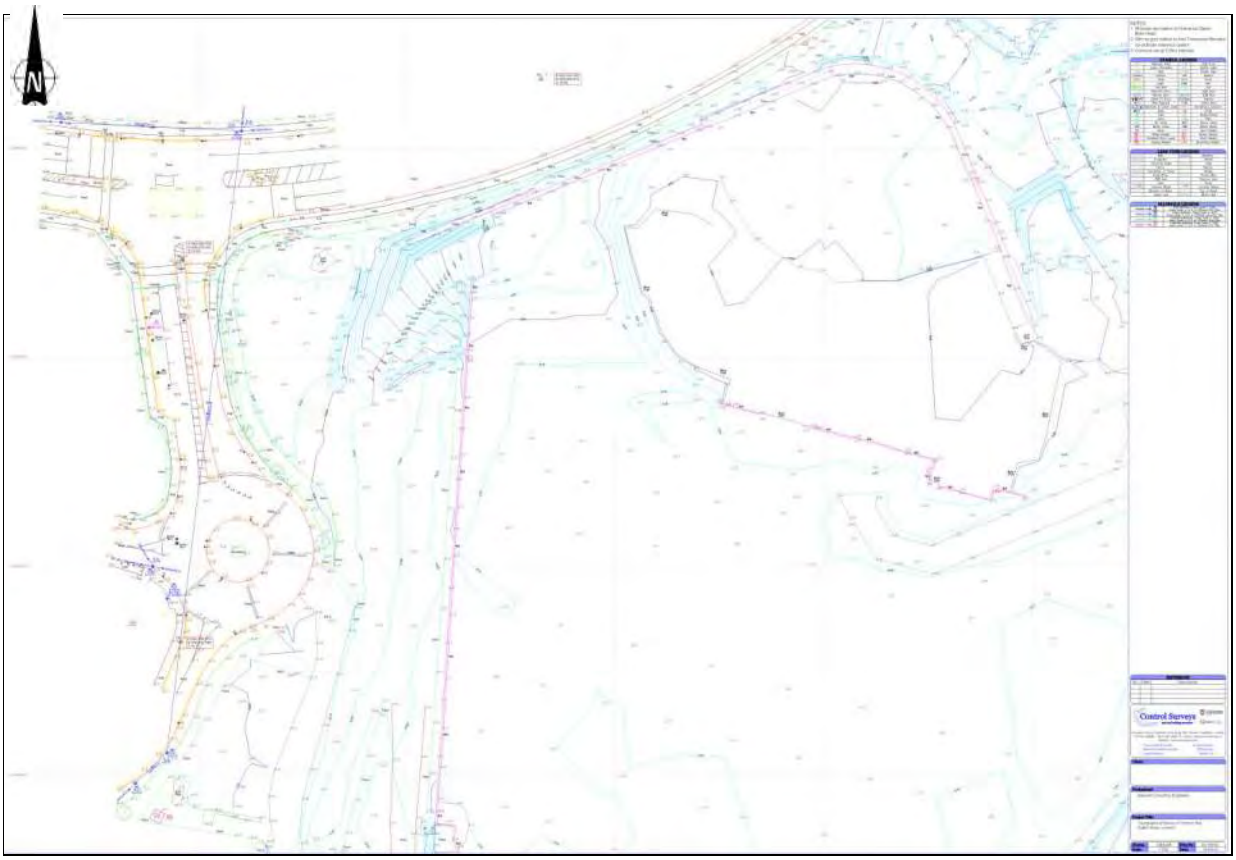


Figure 3-2: Control Surveys Topographical Survey Extent

3.3 Site Walkover

PUNCH Consulting Engineers visited the site on 25th of May 2025 to assess the conditions and key features of the site, to establish any potential sources of flooding and to identify the likely routes of flood waters. Appendix A contains a selection of key images taken during the site visits.

The following was established from the site visit:

a) The site was accessed via the existing access gate on the western boundary of the site.
b) Ponding was evident at the time of the visit.
c) Levels in the site are typically lower than those outside the perimeter of the site boundary.

There are a number of drainage ditches shown on the EPA website throughout the site however based on the recent topographical survey and site walk over, these were not evident within the proposed development site due to the historic works on the site.

No upstream catchments are believed to connect to these drains as all upstream site have been developed with their own surface water networks which discharge into the main drainage.

A new surface water network will cater for on site drainage.

During the ground investigation works, it was found that there is a perched water table on the site. Testing is to be carried out in accordance with the relevant guidelines and dewatering will be carried out in line with best practice.

3.4 Review of Historic Mapping

A review of the OSI Historical maps[1] was carried out. Figure 3-3 shows an extract from the 25-inch historic mapping and the site is not identified as "liable to flood".

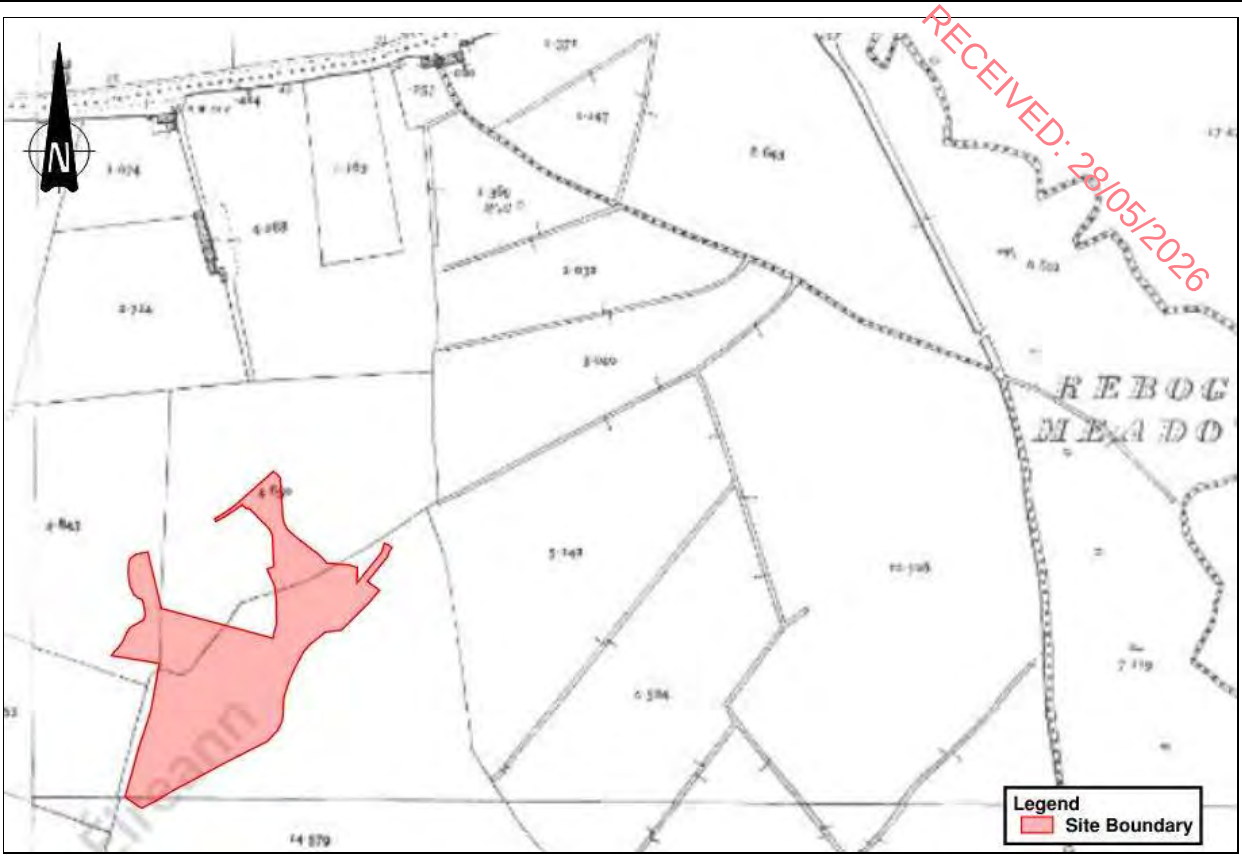


Figure 3-3: Extract from OSI historical 25-inch map

3.5 History of Flooding

The Office of Public Works (OPW) Flood Hazard Mapping website olds a record of historic flood events.

A review of the database indicated that there have been no instances of flooding on the proposed site as shown in Figure 3-4.

Please note that this is not a guaranteed record of all flood events.

Full past flood event report for the area is included in Appendix B of this report.

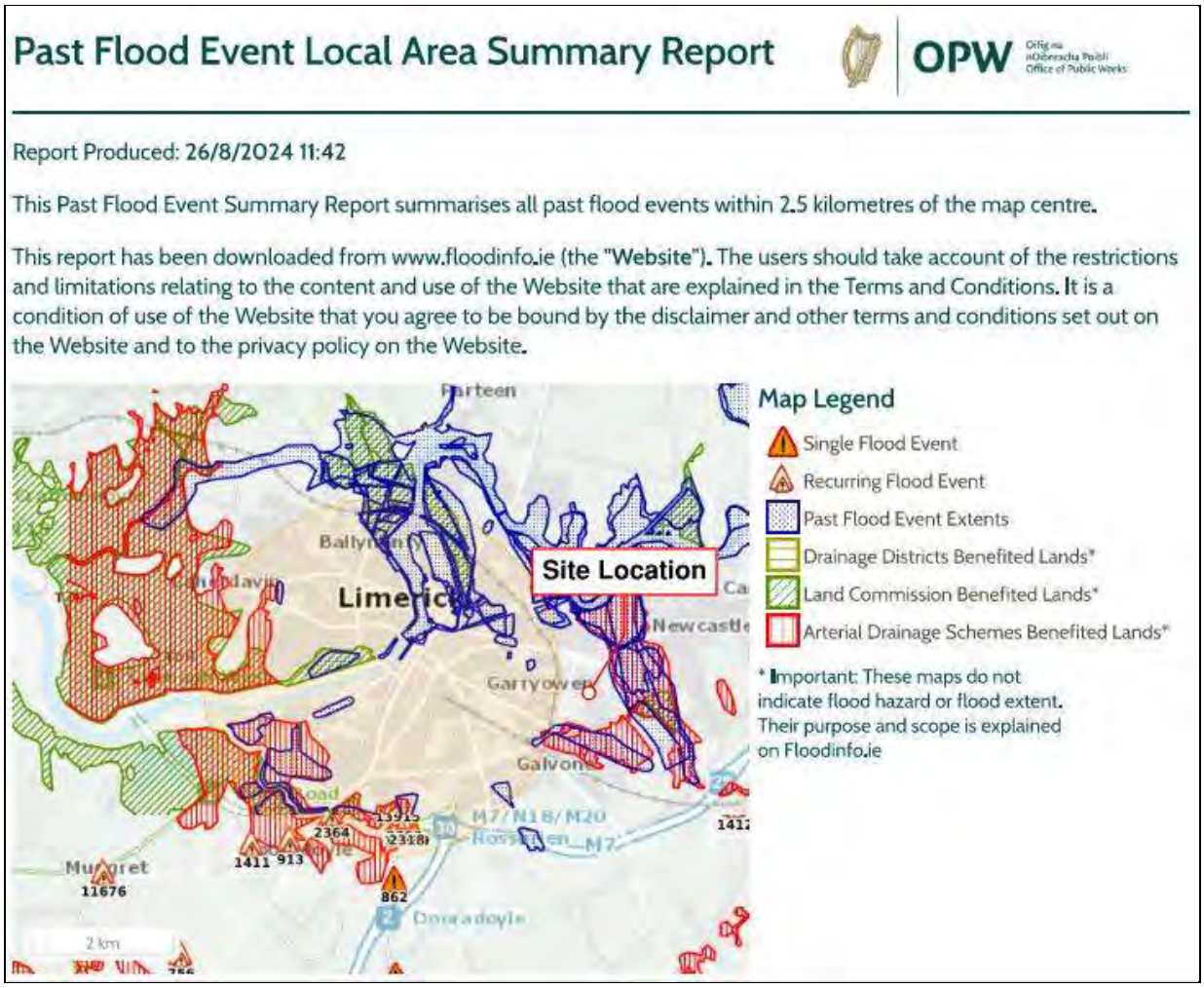


Figure 3-4: Extract from OPW Past Flood Event Local Area Summary Report (Source: Flood Maps - Floodinfo.ie)

3.6 Site Geology

The geology of the site was reviewed using data from the Geological Survey of Ireland (available at www.gsi.ie). The soil type or quaternary sediments within the site boundary are made up of limestone, gravels, and till as shown in Figure 3-5 below. The surrounding areas also comprise of urban ground and silts and clays.

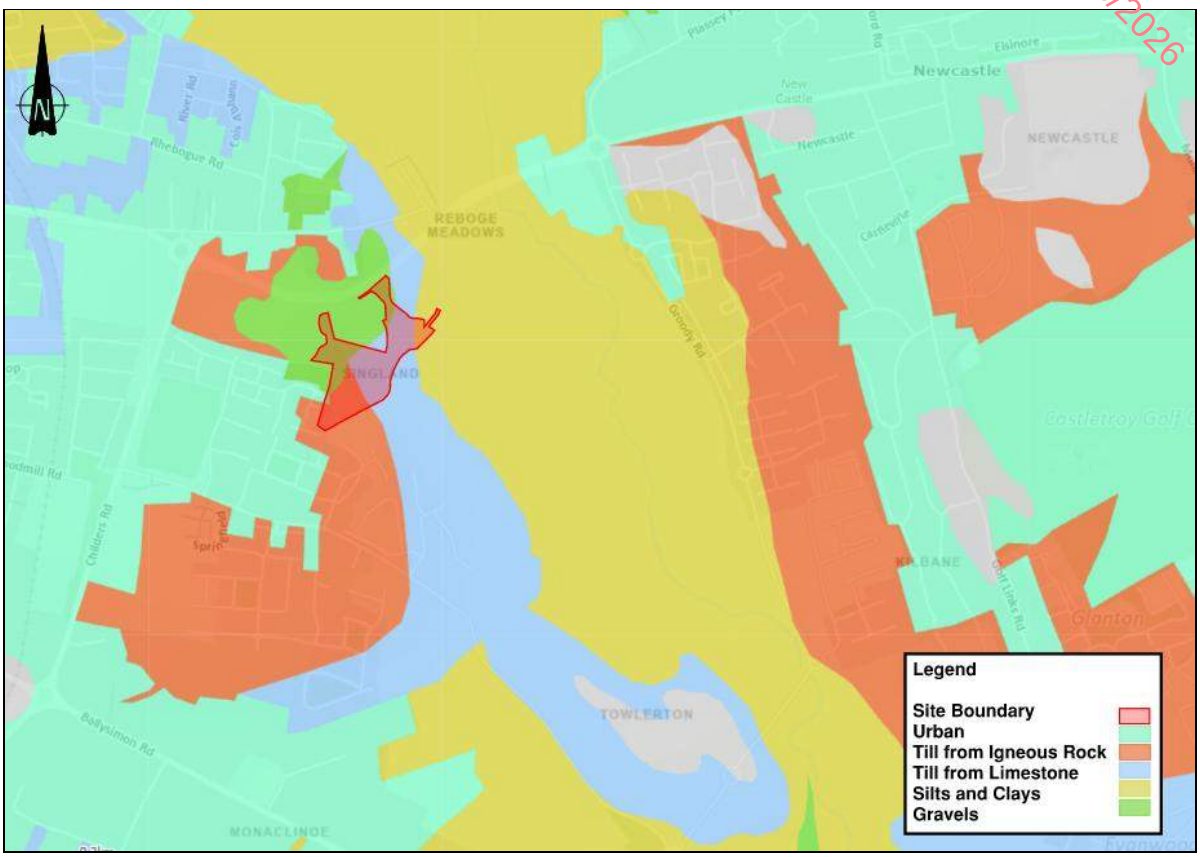


Figure 3-5: Geology of the surrounding area (source: Geological Survey of Ireland (www.gsi.ie))

3.7 Groundwater Flooding

Groundwater flooding occurs when the level of the water stored in the ground rises as a result of prolonged rainfall. A review of data from the Geological Survey of Ireland, indicates a groundwater flood risk to the owned lands but does not intrude the site boundaries.

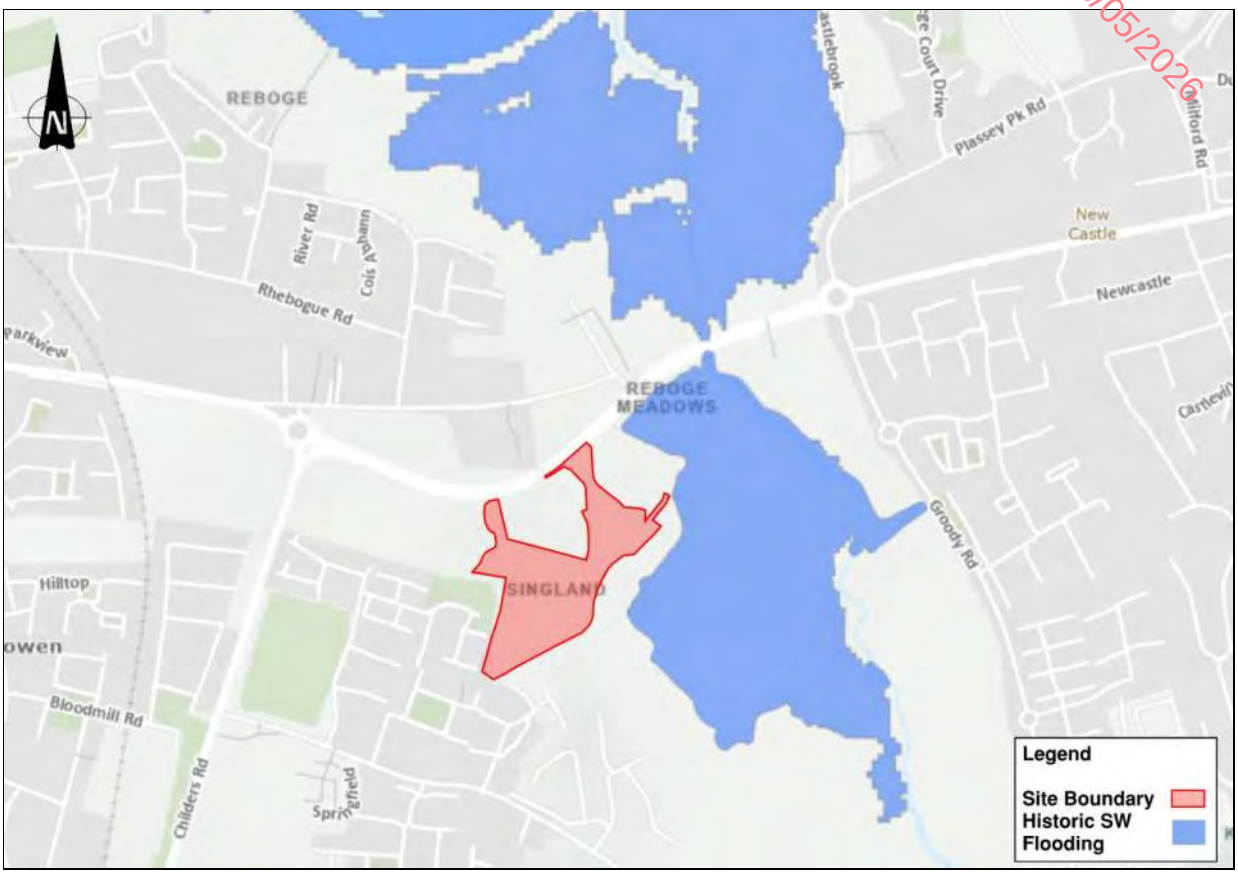


Figure 3-6: Ground water flooding of the surrounding area (source: opendata-geodata-gov-ie.hub.arcgis.com)

3.8 Pluvial Flooding

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high intensity rainfall.

The provision of a suitable surface water drainage system for the proposed development will mitigate against pluvial flood risk as demonstrated in the accompanying Engineering Planning Report. The redevelopment of the site will not adversely affect pluvial flood levels or extents in the area.

3.8.1 Review of Existing Surface Water Infrastructure

A review of the surface water drainage network in the area was undertaken based on the Irish Water GIS database. There is a surface water line to the east of the site located in Chestfield Grove. The surface water drainage infrastructure in the vicinity of the site is shown in Figure 3-7 below.

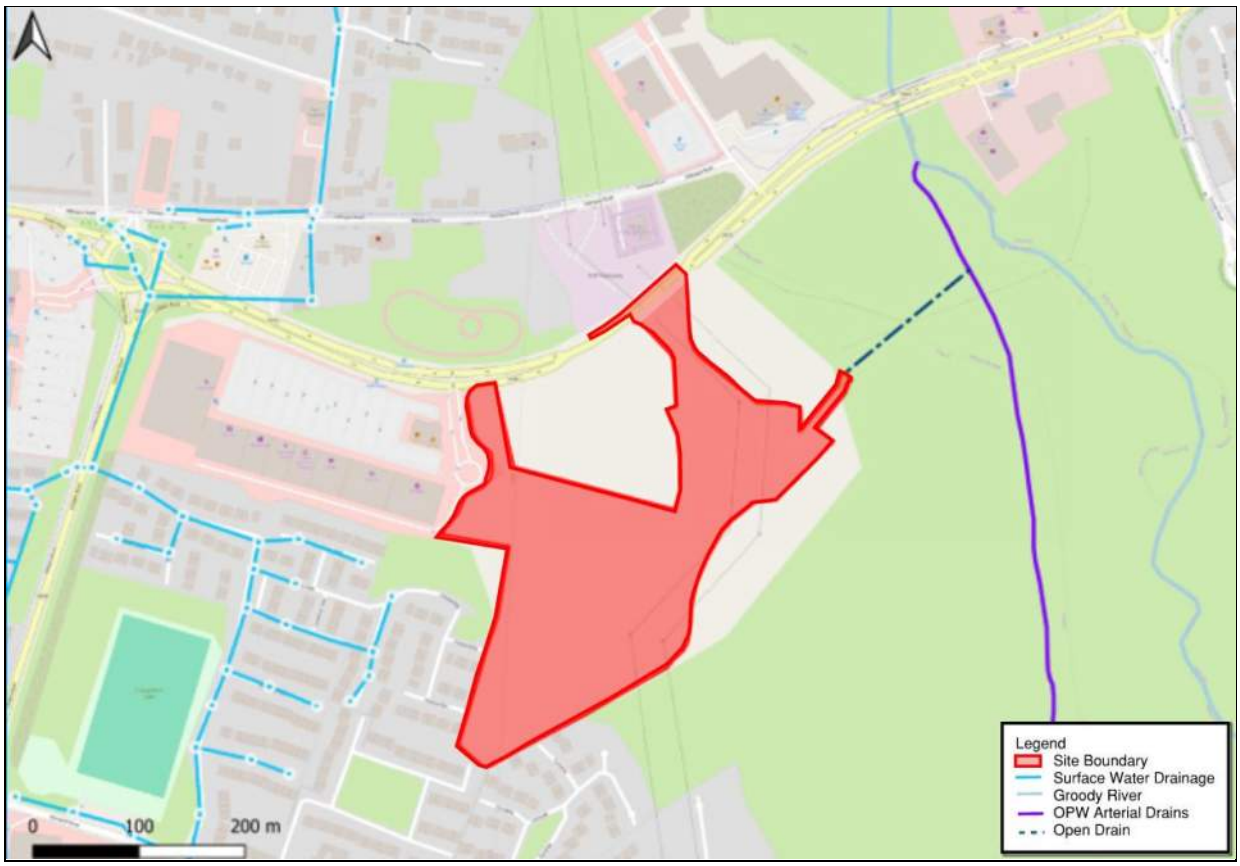


Figure 3-7: Surface Water Infrastructure

3.9 Fluvial Flooding

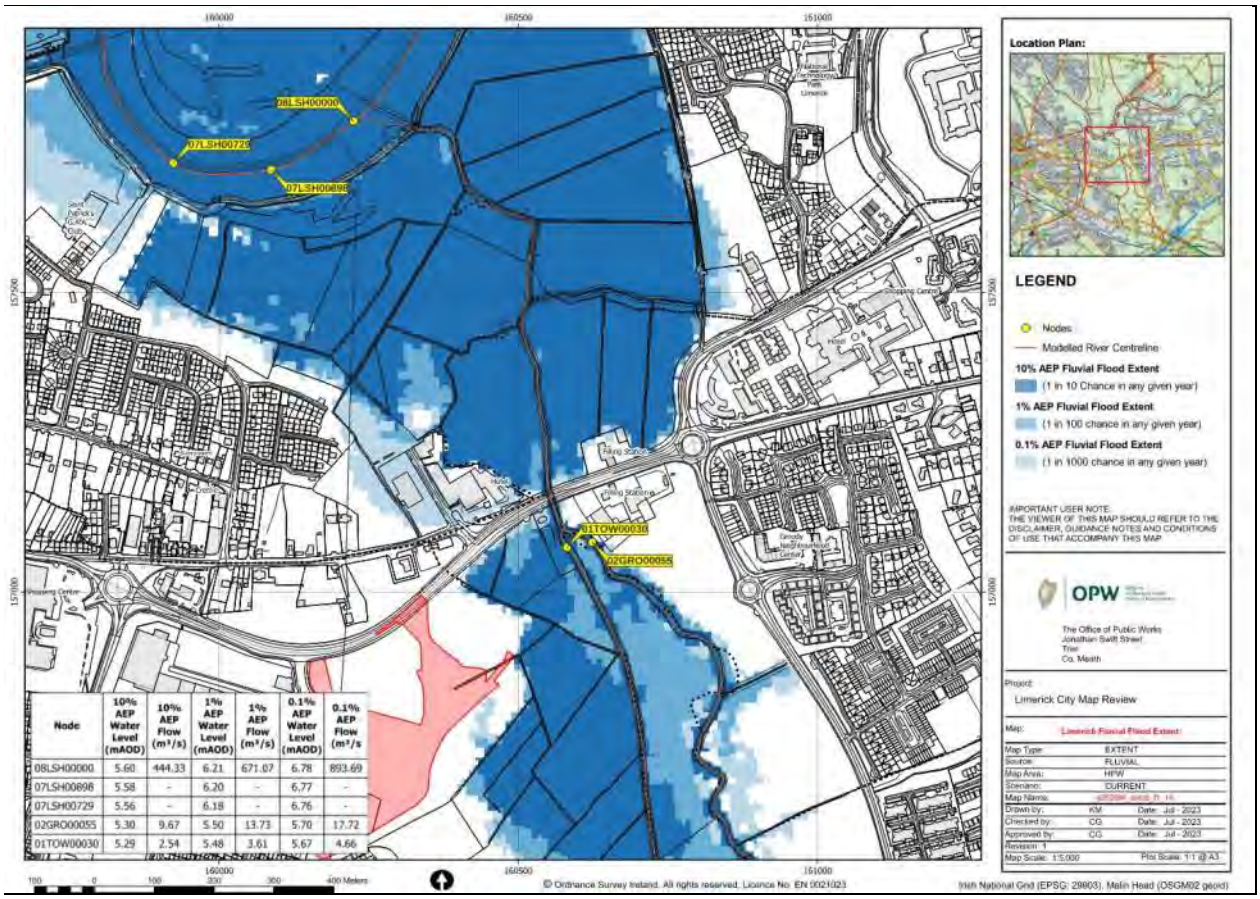
Fluvial flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain.

3.9.1 Catchment Flood Risk Assessment and Management Study (CFRAMS) Mapping

The CFRAMS is an OPW led national programme which seeks to identify and map potential existing and future flood hazard in areas at significant risk from flooding. It also aims to identify flood relief measures and prepare Flood Risk Management Plans for these areas.

The site of the proposed development is located in an area which has been assessed as part of the Shannon CFRAM Study. The OPW has published detailed flood hazard mapping for the area based on results from the CFRAMS. This includes flood extent and flood depth mapping for a number of return periods for fluvial and coastal flood events. The CFRAMS assessment in this area is based on hydraulic modelling of the River Shannon.

Figure 3-8 below shows an extract from the relevant CFRAMS fluvial flood extent map. Full CFRAMS maps for the area are included in Appendix D of this report.



Node	10% AEP Water Level (mAOD)	10% AEP Flow (m³/s)	1% AEP Water Level (mAOD)	1% AEP Flow (m³/s)	0.1% AEP Water Level (mAOD)	0.1% AEP Flow (m³/s
08LSH00000	5.60	444.33	6.21	671.07	6.78	893.69
07LSH00898	5.58	-	6.20	-	6.77	-
07LSH00729	5.56	-	6.18	-	6.76	-
02GRO00055	5.30	9.67	5.50	13.73	5.70	17.72
01TOW00030	5.29	2.54	5.48	3.61	5.67	4.66

Figure 3-8: Extract from the CFRAMS fluvial map for the area (site indicated in red)
Maps available: http:// http://www.floodinfo.ie/map/floodmaps/

The CFRAMS mapping indicates that fluvially influenced flooding impacts the River Groody near the proposed site. The flood levels do not encroach on the main areas of proposed development within the application site.

Table 3-1: CFRAMS Modelled Fluvial Flood Levels Adjacent to the Site

	Flood Level (mAOD) (by Return Period)		
NODE	10%AEP	1%AEP	0.1%AEP
01TOW00030	5.29	5.48	5.67

As shown in Figure 3-10 above, the majority of the application site is located outside of the fluvial flood zones meaning the risk of flooding is very low. However, the surface water discharge pipe downstream of the attenuation pond is located within the flood zone as it is discharging to the river.

3.9.2 Fluvial Flood Depth Analysis

The CFRAMS has produced fluvial flood depth mapping for different AEP events. Figure 3-9 below shows the extents of a 1% AEP fluvial flood.

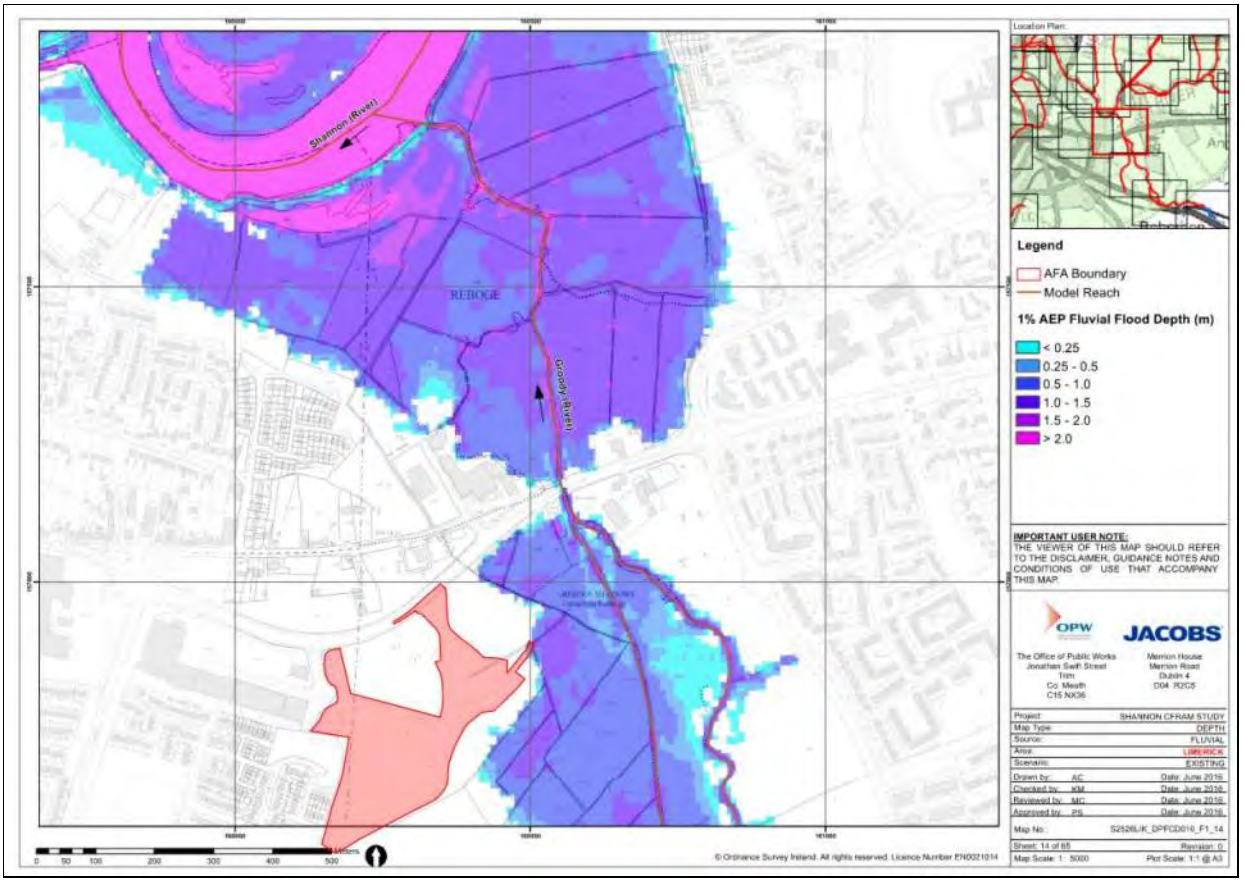


Figure 3-9: 1% AEP Flood extents from breach on River Groody flood embankments

It is observed from the results in Figure 3-9, that floodwaters will not extend into the site, with <1m encroaching on the northeastern corner of the owned lands. This can be attributed to the height of the existing levels rising away from the river.

3.10 Coastal Flooding

Coastal flooding results from sea levels which are higher than normal and result in sea water overflowing onto the land. Coastal flooding is influenced by the following three factors which often work in combination: high tide level, storm surges and wave action.

3.10.1 Catchment Flood Risk Assessment and Management Study

Figure 3-10 below is an extract from the relevant Shannon CFRAMS coastal flood extent map and Appendix D presents the modelled flood levels from the adjacent CFRAMS nodes.

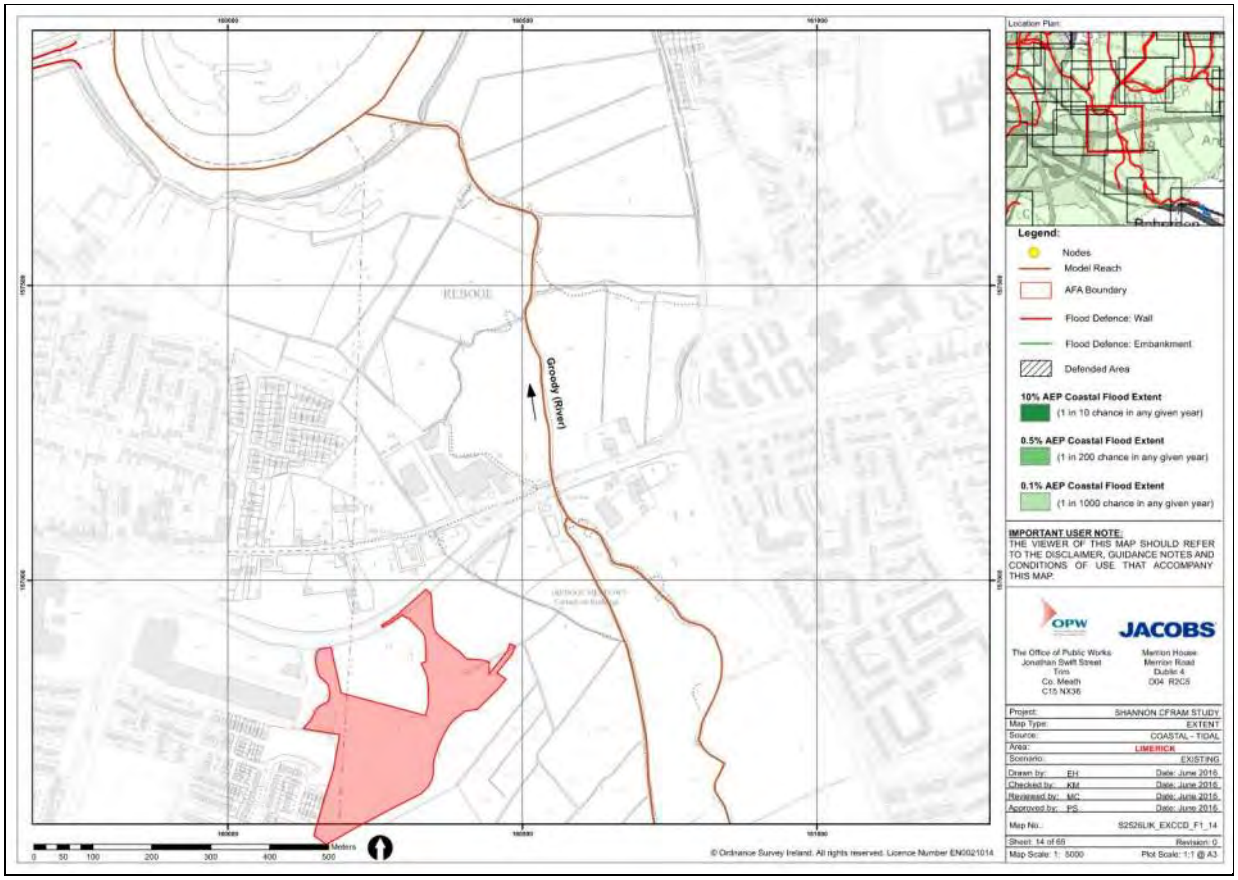


Figure 3-10: Extract from CFRAMS Coastal Flood Extent Mapping Limerick Area

Maps available: http:// http://www.floodinfo.ie/map/floodmaps/

The CFRAMS mapping indicates that coastal influenced flooding does not impact the Groody River in close proximity to the proposed site.

3.10.2 National Coastal Flood Hazard Mapping

The OPW published the National Coastal Flood Hazard Mapping (NCFHM) in 2021 and they are now publicly available on https://www.floodinfo.ie/map/coastal_map/. The NCFHM project produced updated national scale coastal flood extent and depth maps. These maps are 'predictive' flood maps showing indicative areas predicted to be inundated during a theoretical flood event with an estimated probability of occurrence. These flood maps do not take account of any existing flood defences.

Current Scenario NCFHM flood extents in the vicinity of the site can be seen below in Figure 3-11 below. The figure shows that the site is not subject to coastal flooding.

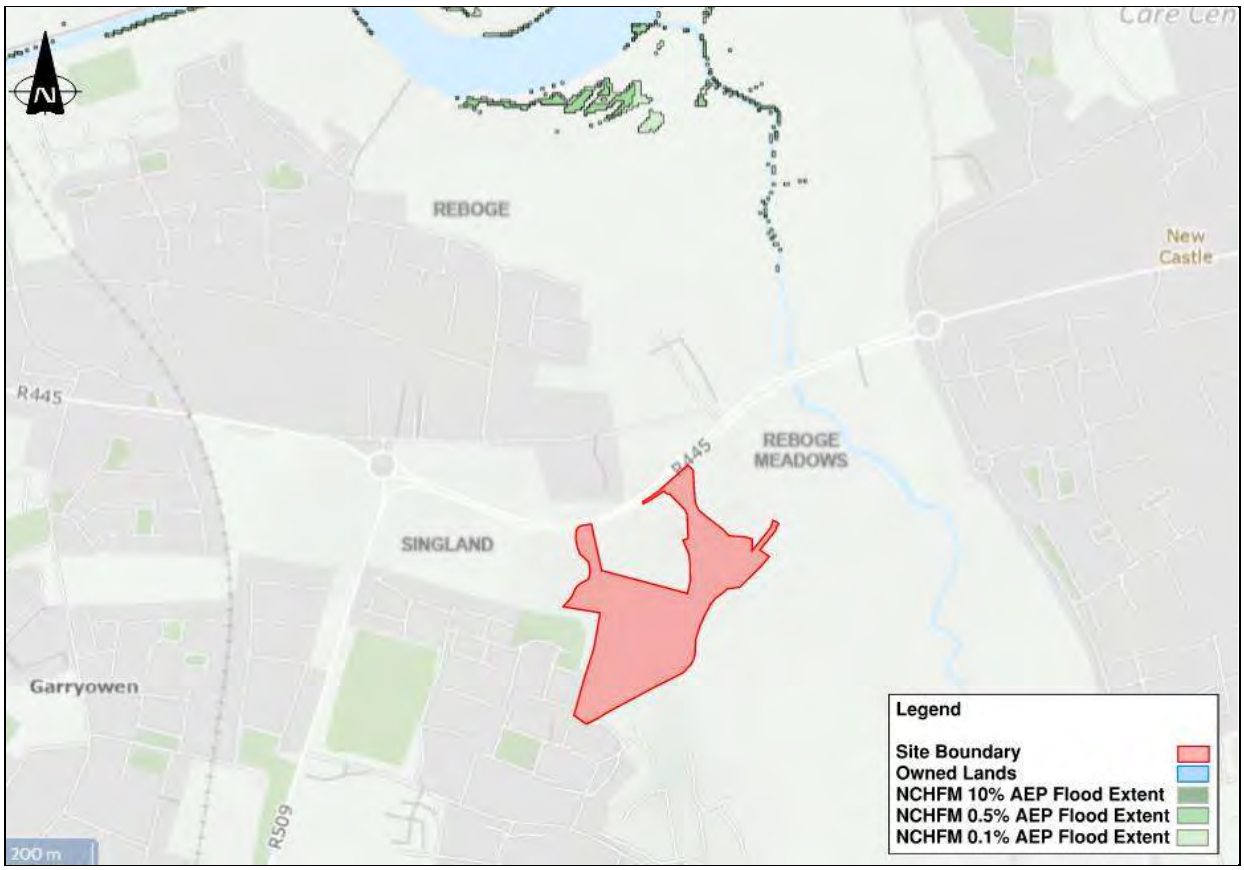


Figure 3-11: NCFHM Flood Extents - Current Scenario

3.11 Limerick DP Strategic Flood Risk Assessment

A review of the Limerick DP 2022-2028 was carried out with regards to flood risk. A Strategic Flood Risk Assessment (SFRA), prepared as part of the LDP, includes Flood Zone mapping for the area and highlights some areas of flood risk concern associated with the nearby River Shannon.

According to the LDP Flood Zone Map of the area (extract presented in Figure 3-12 below), the north eastern corner of the owned lands is shown to be at risk of flooding and is partially located in Flood Zone A. A small section of Zone B encroaches the proposed site boundary. The proposed development is located in Flood Zone C with only the discharge pipe from the attenuation pond located in Flood Zone A as it is proposed to discharge to the open drain which ultimately discharges into the Groody River.

There is no residential or any other element of the proposed development other than an outfall pipe downstream of the attenuation pond located in Flood Zone A or B.

See Appendix E for a copy of the full flood extent map of the area.

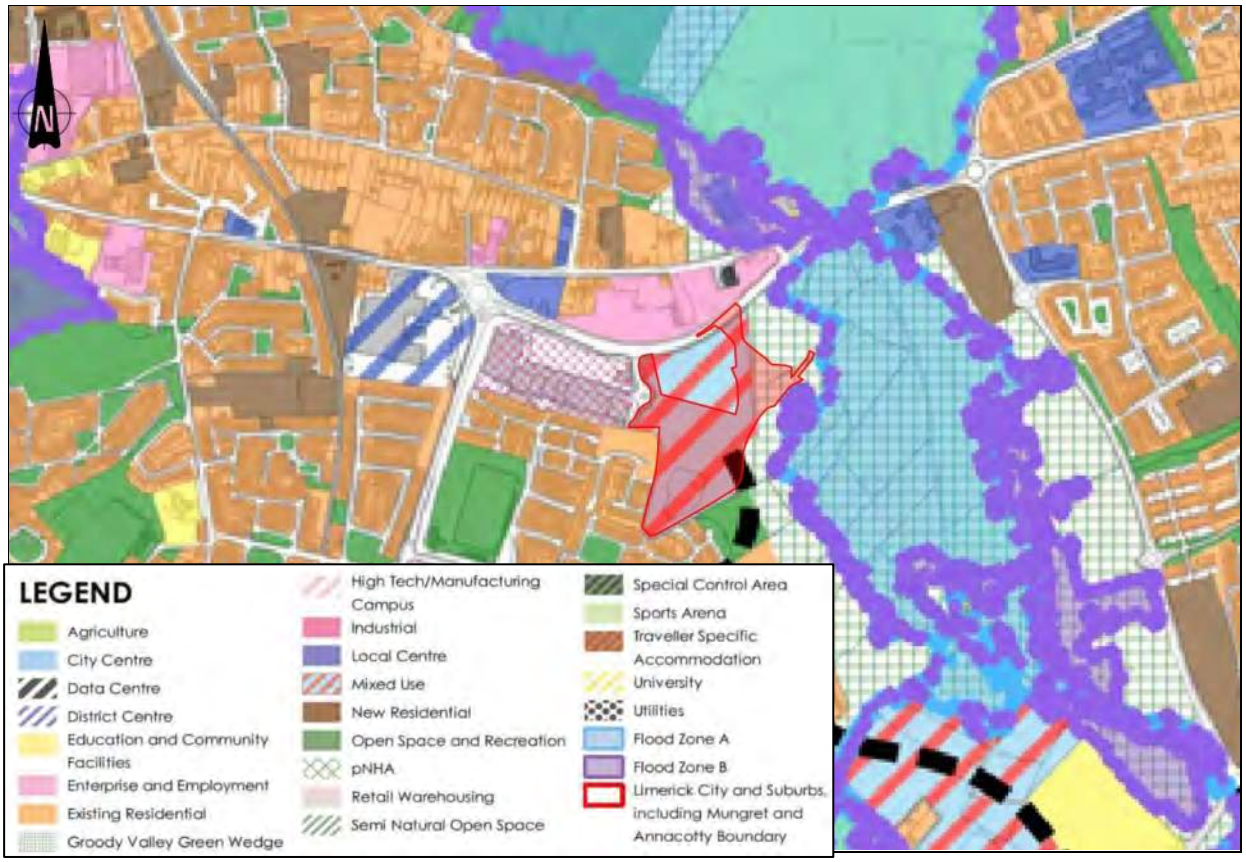


Figure 3-12: Extract from Limerick DP 2022-2028 Flood Zone Map 5

3.12 Estimate of Flood Zone

PUNCH Consulting Engineers have reviewed the available information as outlined in the above sections and have concluded that the development site is located within Flood Zone C. The surface water outfall pipe which discharges into the Grood River will be located within Flood Zone A with all other proposed works located in Flood Zone C.

4 Flood Risk Assessment

4.1 Sources of Flooding

When carrying out a Flood Risk Assessment, one should consider all potential risk and sources of flood water at the site. In general, the relevant flood sources are:

Fluvial Flooding

Fluvial flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain. The proposed site is located approximately 350m west of the River Shannon. From a review of the available information, the majority of the site is not at risk of fluvial flooding with only a small area accommodating a discharge pipe within an area of fluvial risk.

Coastal Flooding

Coastal flooding is the result of sea levels which are higher than normal and result in sea water overflowing onto the land during high tides or storm surges. The site is located 160m from the River Shannon estuary which is tidal and not at risk of coastal flooding.

Pluvial Flooding

Pluvial Flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high-intensity rainfall. The provision of a suitable surface water drainage system for any proposed development on the site will mitigate against this risk.

Groundwater Flooding

Groundwater flooding occurs when the level of the water stored in the ground rises as a result of prolonged rainfall. From a review of the available information, the site is considered to be at low risk to groundwater flooding.

4.2 Site Vulnerability

The proposed development is residential & business in nature, which is classified as "Highly Vulnerable" and "Less Vulnerable" respectively. The Planning System and Flood Risk Management Guidelines gives definitions for the type of developments that can take place in each Flood Zone. Only Coastal and Fluvial flood zones are considered in determining whether a Justification Test is required.

Table 4-1: Matrix of Vulnerability versus Flood Zone to indicate Justification Requirement

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

As all of the proposed development other than a discharge pipe downstream of an attenuation pond is located in Flood Zone C it is located in an appropriate zone and therefore a justification test is not required as per Table 4-1 above.

4.3 Climate Change

Advice on the expected impacts of climate change and the allowances to provide for future flood risk management in Ireland is given in the OPW's "Flood Risk Management Climate Change Sectoral Adaptation Plan", 2019. Two climate change scenarios are considered. These are the Mid-range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "conservative" future scenario at the upper boundaries of future projections.

A table summarising the recommended climate change allowances is provided in Table 5-1 of the "Flood Risk Management Climate Change Sectoral Adaptation Plan". This table has been reproduced here as Table 4-2.

Table 4-2 Recommended allowances for climate change

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Peak Flood Flows	+20%	+30%
Mean Sea Level Rise	+500 mm	+1000 mm
Land Movement	-0.5 mm/year*	-0.5 mm/year*
Urbanisation	No general allowance - Review on Case by Case Basis	No general allowance - Review on Case by Case Basis
Forestation	-1/6Tp**	-1/3Tp** +10% SPR***
Notes: * Applicable to the southern part of the country (Dublin - Galway and south of this) ** Reduction in the time to peak (Tp) to allow for potential accelerated runoff that may arise as a result of drainage of afforested land *** Add 10% to the Standard Percentage Runoff (SPR) rate; This allows for temporary increased runoff rates that may arise flowing felling of forestry		

Based on the recommendations presented in Table 4-2, 500mm for water level plus 50mm for land movement should be applied for climate change allowance. The 1%MRFS is therefore 6.03mAOD.

4.4 Finished Floor Levels

As per Table 5-3 of the LDP SFRA, the recommended minimum building Finished Floor Level (FFL) for the proposed development is 1%MRFS + freeboard (0.3m as there is no risk of storm surge and wave action). The minimum recommended finished floor level for the site is therefore 6.33mAOD.

4.5 Flood Mitigation Measures

A review of the available data indicates that the development is mostly located within Flood Zone C however the surface water outfall pipe which discharges to the Groody River will be located within Flood Zone A. All other proposed works will be located in Flood Zone C.

The following measures should be considered in the development design at a minimum:

- The proposed lowest FFL for the proposed development is 10.20mAOD.

  This level is in accordance with best practice and 4.17m above the CFRAMS 1% AEP MRFS fluvial water level.

- PUNCH Consulting Engineers recommend that as part of the site maintenance plan, all future proprietors inspect all road gullies in the vicinity and report any blockages to the Local Authority, development management company and/or Irish Water. The proprietor should also inspect all surface water drainage within the site, in particular following heavy rain which may cause debris to obstruct the ACO drain and road gullies;
- The proposed development will provide stormwater drainage in accordance with the Local Authority Development Plan to alleviate pluvial flooding risk.

With the implementation of the above measures the site will be at low risk of flooding and will not increase the risk of flooding to any adjacent or nearby area.

4.6 Flood Risk Management

Flood risk management under the EU Floods Directive aims to minimise the risks arising from flooding to people, property and the environment. Minimising risk can be achieved through structural measures that block or restrict the pathways of floodwaters, such as river defences or non-structural measures that are often aimed at reducing the vulnerability of people and communities such as flood warning, effective flood emergency response, or resilience measures for communities or individual properties.

5 Conclusions

PUNCH Consulting Engineers was appointed by the Kirkland Investments Ltd to carry out a Site-Specific Flood Risk Assessment for a proposed residential and commercial development on the Dock Road, Limerick City.

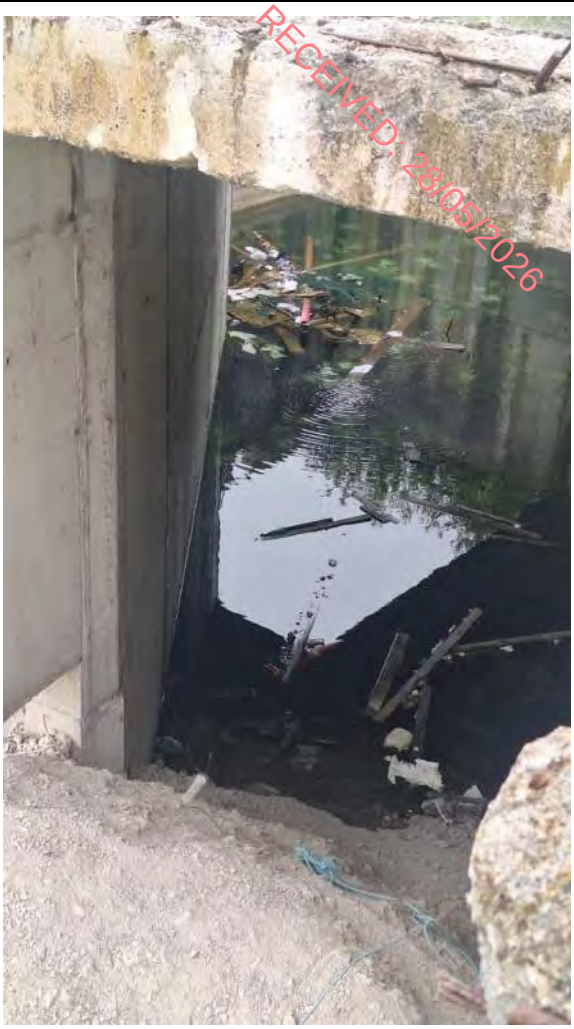
This Site-Specific Flood Risk Assessment has been carried out in accordance with *"The Planning System & Flood Risk Management Guidelines"* published by the Department of the Environment, Heritage and Local Government in November 2009 and the Limerick Development Plan 2022-2028.

A review of the flood risk in the area was carried out as the site is located near the River Groody.

Flood Maps produced as part of the CFRAMS and the LDP SFRA were consulted to establish the Flood Zone. It was determined that the site is primarily located in Flood Zone C. The surface water outfall pipe which discharges into the Grood River will be located within Flood Zone A with all other proposed works located in Flood Zone C for fluvial flooding.

The proposed development is at a low risk of flooding and is deemed appropriate provided the residual risk of fluvial flooding is addressed by flood mitigation measures included in Section 4.5. When examined using the sequential approach proposed in the *"The Planning System & Flood Risk Management"* Guidelines, the proposed development is appropriate.

Appendix A Site Visit Images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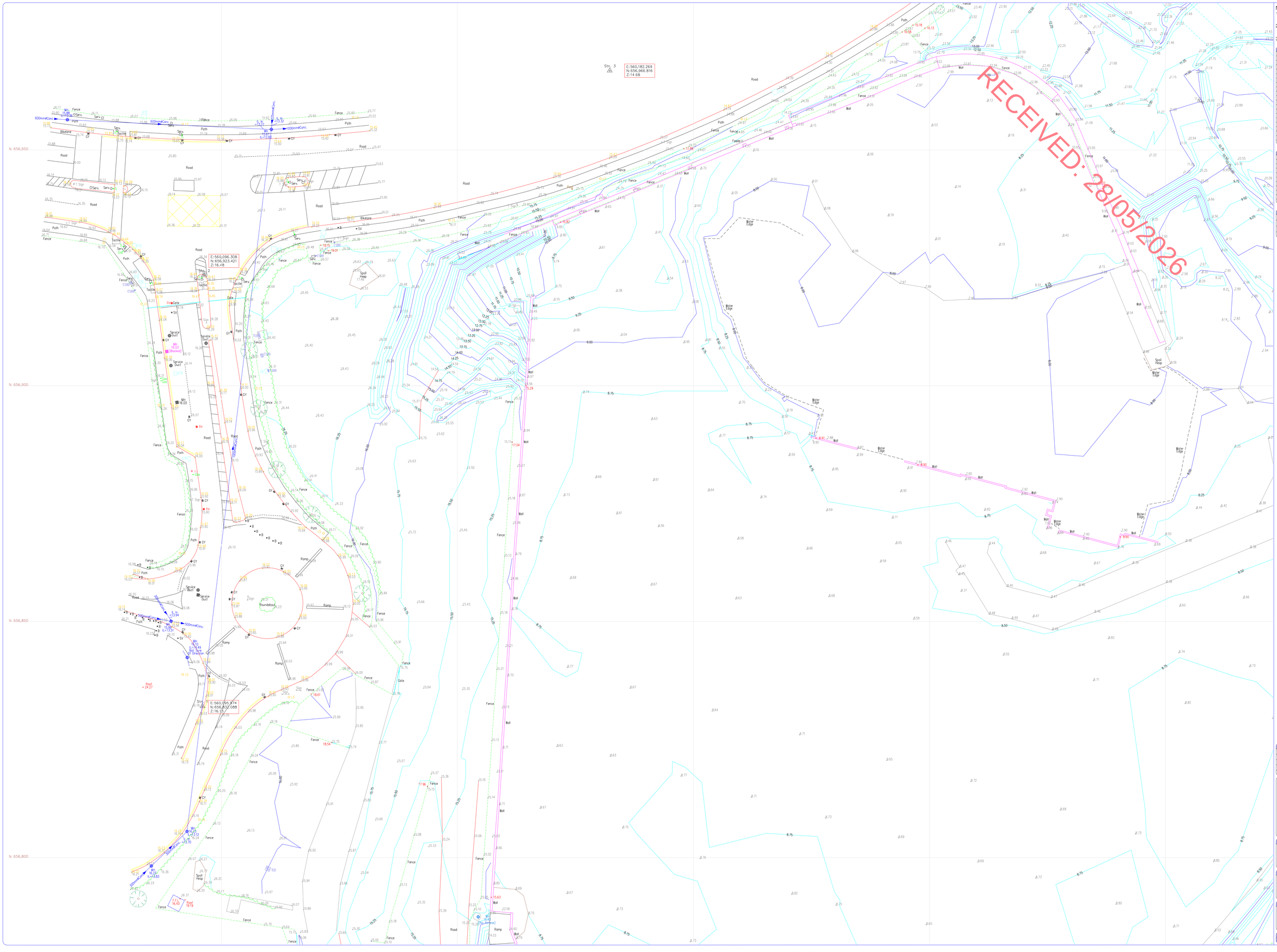
Appendix B Topographical Survey



NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND

ESB Pole	Telecom Pole	ESB Pole	Telecom Pole
Traffic Light	Lamp Standard	Traffic Light	Lamp Standard
Traffic Sign	Sign	Traffic Sign	Sign
Bollard	Camera	Bollard	Camera
Post	Stay	Post	Stay
Bin	Light	Bin	Light
Gas	Gas Box	Gas	Gas
ESB Duct	Telecom Duct	ESB Duct	Telecom Duct
ESB Box	Telcom Box	ESB Box	Telcom Box
Service	Cable TV Duct	Service	Cable TV Duct
Earth Rod	Fire Hydrant	Earth Rod	Fire Hydrant
Armstrong Junction	Manhole & Cover Level	Armstrong Junction	Manhole & Cover Level
Drain	Gully	Drain	Gully
Bush/Shrub	Tree	Bush/Shrub	Tree
Pipe	Gate	Pipe	Gate
Sluice Valve	Air Valve	Sluice Valve	Air Valve
Water Meter	Water Valve	Water Meter	Water Valve
Spot Height	Valve	Spot Height	Valve
Eaves Height	Ridge Height	Eaves Height	Ridge Height
Roof Height	Finished Floor Level	Roof Height	Finished Floor Level
Boundary Height	Coping Height	Boundary Height	Coping Height

LINE TYPE LEGEND

Building	Wall	Building	Wall
Plinth	Footpath	Plinth	Footpath
Step	Concrete Edge	Step	Concrete Edge
Mound	Fence	Mound	Fence
Hedge	Centerline of Trees	Hedge	Centerline of Trees
Flower Bed	Drain/River	Flower Bed	Drain/River
Telecom Line	ESB Line	Telecom Line	ESB Line
Road	Kerb	Road	Kerb
Contour Minor	Contour Major	Contour Minor	Contour Major
Top of Bank	Bottom of Bank	Top of Bank	Bottom of Bank
White Line	Yellow Line	White Line	Yellow Line

MANHOLE LEGEND

Foul Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø F.W. Pipe	150mmØFW
Combined Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Foul Pipe	150mmØFoul
Combined Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Foul Pipe	150mmØFoul
Unknown Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Foul Pipe	150mmØFoul

REVISIONS

No.	Date	Description

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- Topographical Surveys
- Measured Building Surveys
- Legal Mapping
- As Built Surveys
- GPS Surveys
- Setting Out

Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site, Dublin Road, Limerick.

Drawn:	CB&DB	**Dwg No:**	23-140-01
Scale:	1:250	**Date:**	10-03-23

NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND

Tel	Telecom Pole	GP	ESB Pole
LS	Lamp Standard	TL	Traffic Light
Sign	Sign	Sign	Traffic Sign
Camera	Camera	B	Bollard
Stay	Stay	Post	Post
Light	Light	Bin	Bin
GasBox	Gas Box	Gas	Gas
	Telecom Duct		ESB Duct
TB	Telcom Box	ESB	ESB Box
CATV	Cable TV Duct	Serv.	Service
FH	Fire Hydrant	ER	Earth Rod
	Manhole & Cover Level	AJ	Armstrong Junction
GY	Gully	RD	Drain
	Tree		Bush/Shrub
	Gate	Pipe	Pipe
AV	Air Valve	SV	Sluice Valve
WV	Water Valve	MM	Water Meter
V	Valve		Spot Height
	Ridge Height		Eaves Height
	Finished Floor Level		Roof Height
	Coping Height		Boundary Height

LINE TYPE LEGEND

	Wall		Building
	Footpath		Plinth
	Concrete Edge		Step
	Fence		Mound
	Centerline of Trees		Hedge
	Drain/River		Flower Bed
	ESB Line		Telecom Line
	Kerb		Road
	Contour Major		Contour Minor
	Bottom of Bank		Top of Bank
	Yellow Line		White Line

MANHOLE LEGEND

150mmFC	Foul Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm Pipe
150mmCon	Combined Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm Concrete Pipe
150mmCly	Combined Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm Clay Pipe
150mmSW	Unknown Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm PVC Pipe

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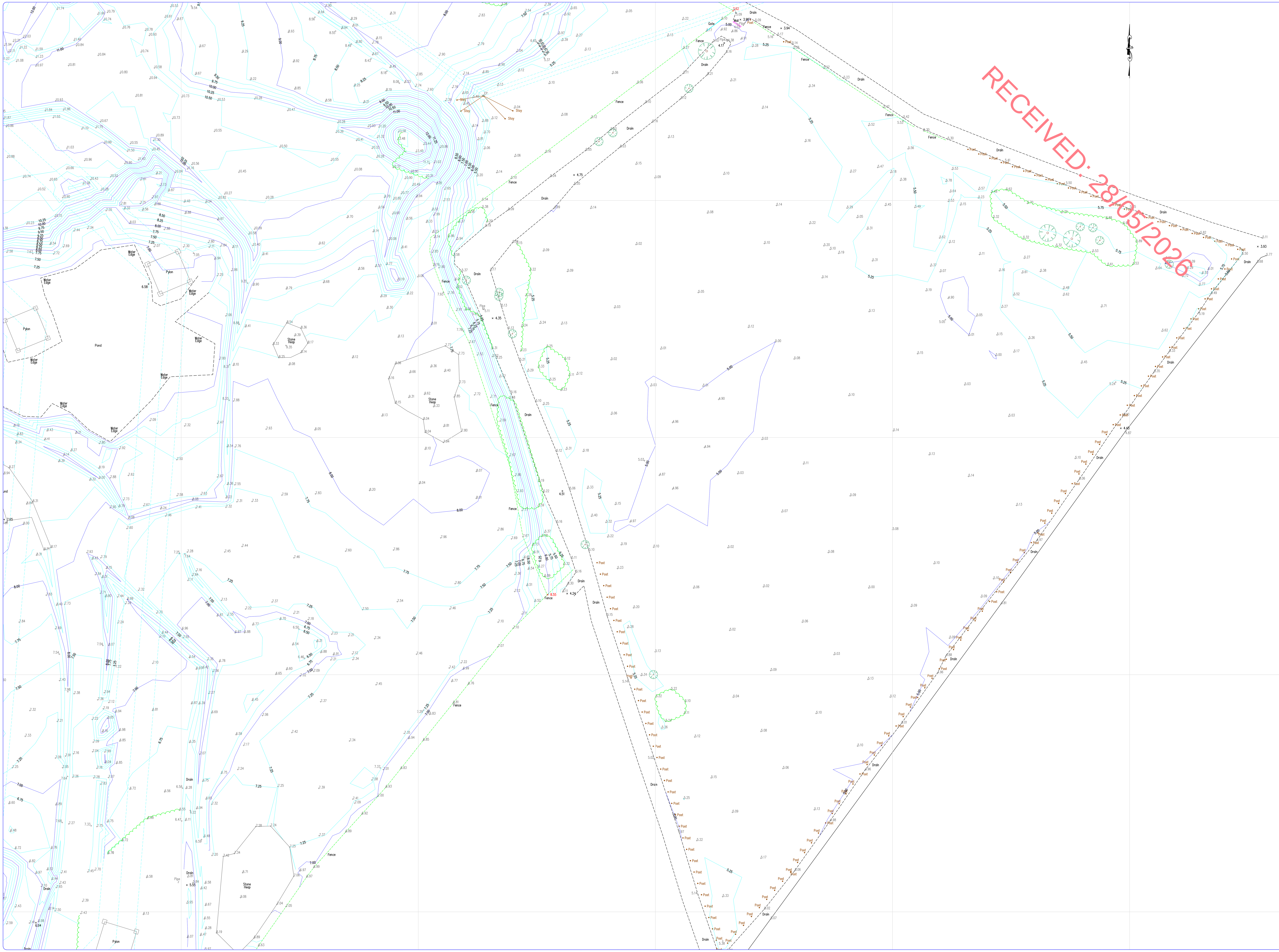
- Measured Building Surveys
- Legal Mapping
- As Built Surveys
- GPS Surveys
- Setting Out

Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site, Dublin Road, Limerick.

Drawn:	C.Ó.S.	Dwg No:	23-140-02
Scale:	1:250	Date:	10-03-23



NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND			
TP	Telecom Pole	EP	ESB Pole
LS	Lamp Standard	TL	Traffic Light
Sign	Sign	T Sign	Traffic Sign
Camera	Camera	B	Bollard
Stay	Stay	Post	Post
Light	Light	Bin	Bin
GasB	Gas Box	Gas	Gas
ICTE	Telecom Duct	ICE	ESB Duct
TEB	Telcom Box	ESBB	ESB Box
CATV	Cable TV Duct	Serv.	Service
FH	Fire Hydrant	ER	Earth Rod
MH 4.93	Manhole & Cover Level	AJ	Armstrong Junction
GY	Gully	D	Drain
	Tree		Bush/Shrub
	Gate	Pipe	Pipe
AV	Air Valve	SV	Sluice Valve
WV	Water Valve	WM	Water Meter
V	Valve	9.55	Spot Height
Ridge 8.73 ×	Ridge Height	Eaves 8.73 ×	Eaves Height
F.F.L 8.73 ×	Finished Floor Level	Roof 8.73 ×	Roof Height
Coping 8.73 ×	Coping Height	6.78 ×	Boundary Height

LINE TYPE LEGEND			
	Wall		Building
	Footpath		Plinth
	Concrete Edge		Step
	Fence		Mound
	Centerline of Trees		Hedge
	Drain/River		Flower Bed
	ESB Line		Telecom Line
	Kerb		Road
11.00	Contour Major	10.75	Contour Minor
	Bottom of Bank		Top of Bank
	Yellow Line		White Line

MANHOLE LEGEND	
150mmøPVC MH 4.93 IL=2.11	Foul Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø PVC Pipe
150mmøConc MH 4.93 IL=2.11	Storm Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Concrete Pipe
150mmøClay MH 4.93 IL=2.11	Combined Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Clay Pipe
150mmøPVC MH 4.93 IL=2.11	Unknown Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø PVC Pipe

REVISIONS		
No.	Date	Description

Control Surveys
land and building surveyors

Society of Chartered Surveyors Ireland
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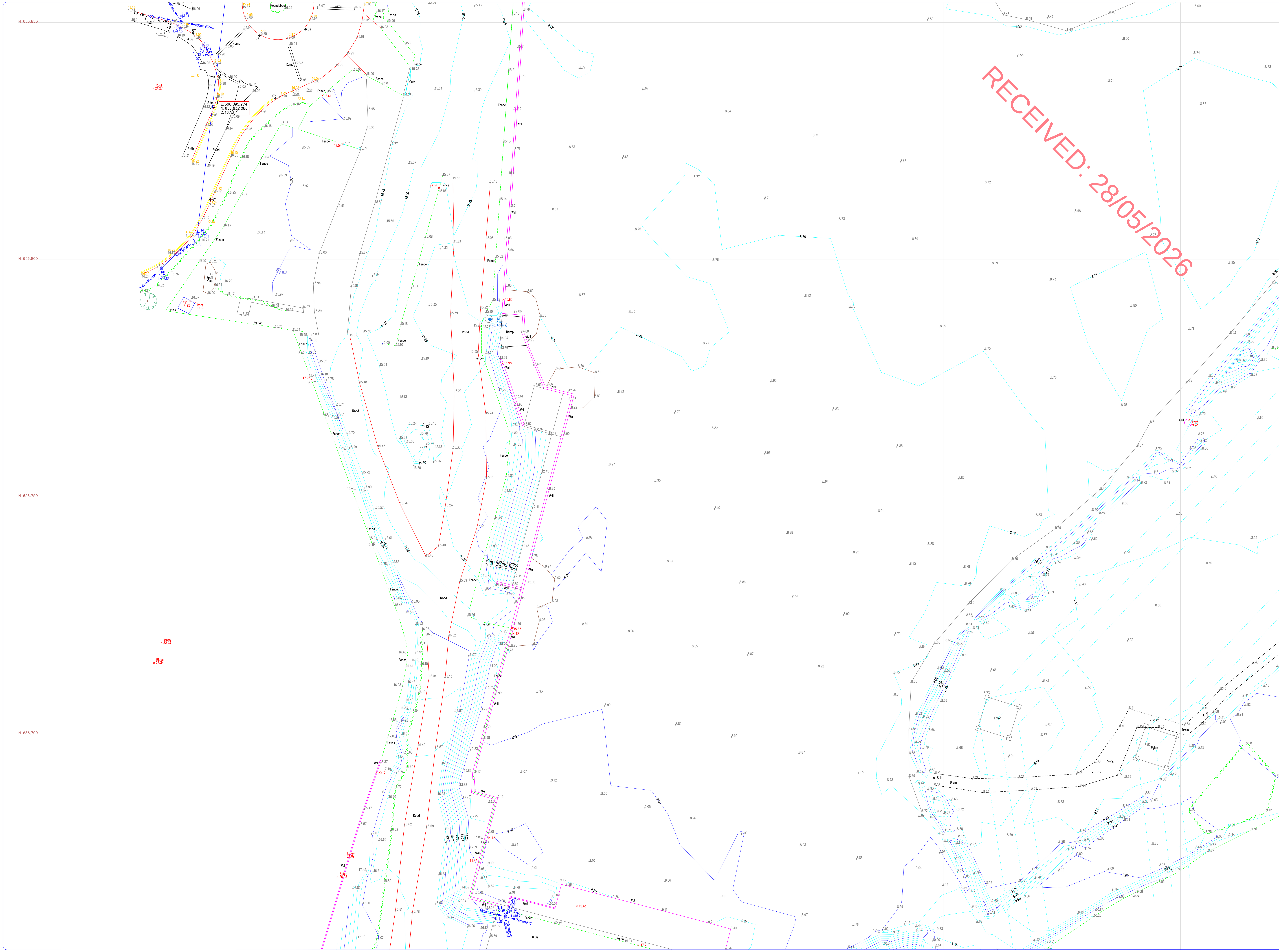
- Topographical Surveys
- Measured Building Surveys
- Legal Mapping
- As Built Surveys
- GPS Surveys
- Setting Out

Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site,
Dublin Road, Limerick.

Drawn:	CB&IR	Dwg No:	23-140-03
Scale:	1:250	Date:	10-03-23



NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND

TP	Telecom Pole	EP	ESB Pole
LS	Lamp Standard	TL	Traffic Light
Sign	Sign	T Sign	Traffic Sign
Camera	Camera	B	Bollard
Stay	Stay	Post	Post
Light	Light	Bin	Bin
GasB	Gas Box	Gas	Gas
ICTE	Telecom Duct	ICE	ESB Duct
TEB	Telcom Box	ESBB	ESB Box
CATV	Cable TV Duct	Serv.	Service
FH	Fire Hydrant	ER	Earth Rod
MH 4.93	Manhole & Cover Level	AJ	Armstrong Junction
GY	Gully	D	Drain
	Tree		Bush/Shrub
	Gate	Pipe	Pipe
AV	Air Valve	SV	Sluice Valve
WV	Water Valve	WM	Water Meter
V	Valve	9.55	Spot Height
Ridge 8.73 ×	Ridge Height	Eaves 8.73 ×	Eaves Height
F.F.L 8.73 ×	Finished Floor Level	Roof 8.73 ×	Roof Height
Coping 8.73 ×	Coping Height	6.78 ×	Boundary Height

LINE TYPE LEGEND

	Wall		Building
	Footpath		Plinth
	Concrete Edge		Step
	Fence		Mound
	Centerline of Trees		Hedge
	Drain/River		Flower Bed
	ESB Line		Telecom Line
	Kerb		Road
11.00	Contour Major	10.75	Contour Minor
	Bottom of Bank		Top of Bank
	Yellow Line		White Line

MANHOLE LEGEND

150mmøPVC MH 4.93 IL=2.11	Foul Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø PVC Pipe
150mmøConc MH 4.93 IL=2.11	Storm Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Concrete Pipe
150mmøClay MH 4.93 IL=2.11	Combined Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø Clay Pipe
150mmøPVC MH 4.93 IL=2.11	Unknown Manhole, Cover Level = 4.93, Invert Level = 2.11 & 150mmø PVC Pipe

REVISIONS

No.	Date	Description

Control Surveys
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- Measured Building Surveys
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- As Built Surveys
- GPS Surveys
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Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site, Dublin Road, Limerick.

Drawn:	CB&IR	Dwg No:	23-140-04
Scale:	1:250	Date:	10-03-23

NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND

ESB	Telecom Pole	ESB	ESB Poles
	Lamp Standard		Traffic Light
Sign	Sign	Sign	Traffic Sign
Corners	Corners		Bollard
Stay	Stay	Post	Post
Light	Light	Bin	Bin
GAS Gas	Gas Box	Gas	Gas
	Telecom Duct		ESB Duct
	Telcom Box	ESB	ESB Box
CATV	Cable TV Duct	Service	Service
FH	Fire Hydrant	ER	Earth Rod
	Manhole & Cover Level		Armstrong Junction
CI	Gully	SD	Drain
	Tree		Bush/Shrub
	Gate	uPipe	Pipe
AV	Air Valve	SV	Sluice Valve
WV	Water Valve	WM	Water Meter
V	Valve		Spot Height
	Ridge Height		Eaves Height
	Finished Floor Level		Roof Height
	Coping Height		Boundary Height

LINE TYPE LEGEND

	Wall		Building
	Footpath		Plinth
	Concrete Edge		Step
	Fence		Mound
	Centerline of Trees		Hedge
	Drain/River		Flower Bed
	ESB Line		Telecom Line
	Kerb		Road
	Contour Major		Contour Minor
	Bottom of Bank		Top of Bank
	Yellow Line		White Line

MANHOLE LEGEND

150mmFC	Foul Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm Foul Pipe
150mmCon	Foul Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mmØ Concrete Pipe
150mmCly	Combined Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mmØ Clay Pipe
150mmPVC	Unknown Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mmØ PVC Pipe

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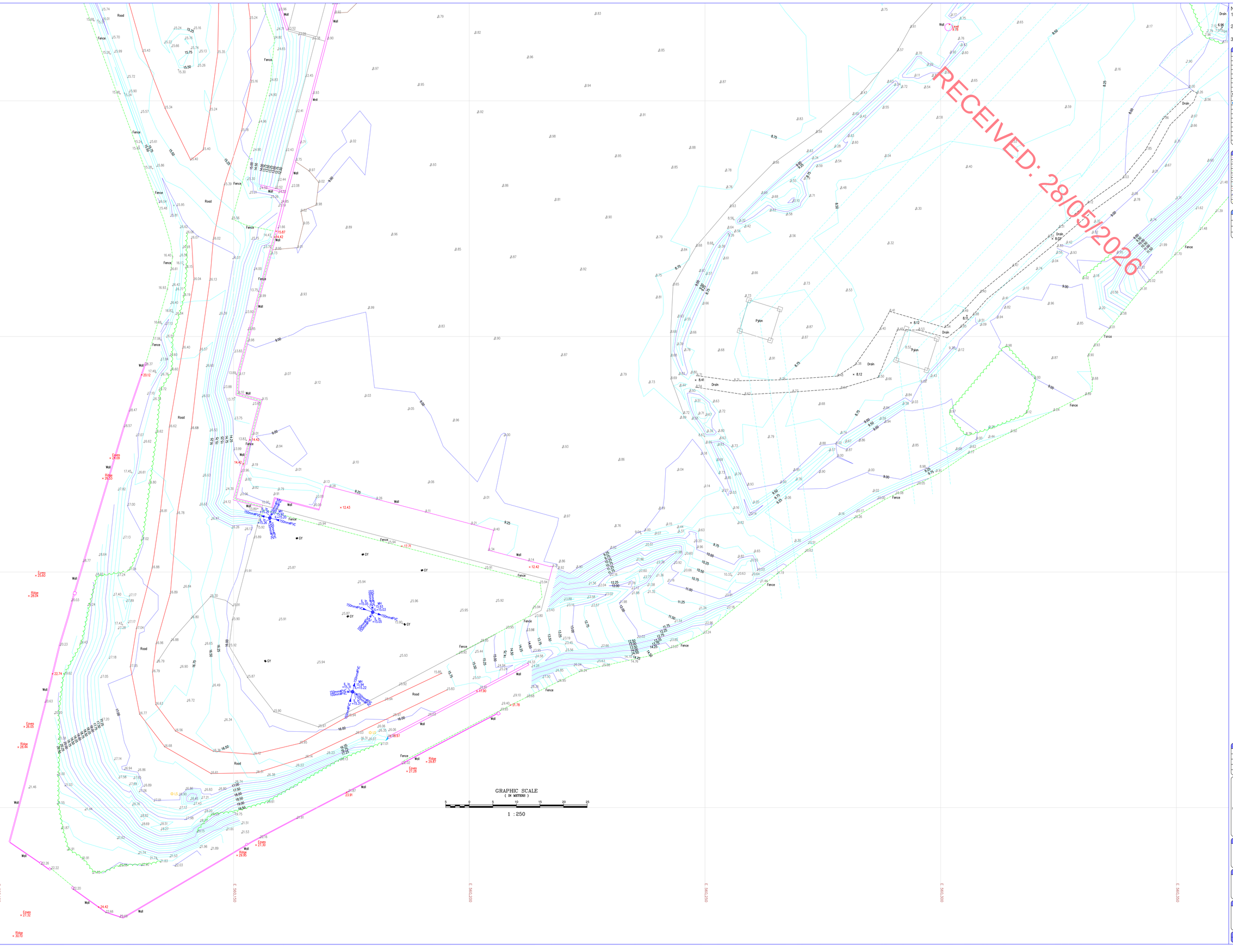
- Topographical Surveys
- Measured Building Surveys
- Legal Mapping
- As Built Surveys
- GPS Surveys
- Setting Out

Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site,
Dublin Road, Limerick.

Drawn:	CB&JG	Dwg No:	23-140-05
Scale:	1:250	Date:	10-03-23



NOTES:
1. All levels are relative to Ordnance Datum Malin Head
2. 50m sq grid relative to Irish Transverse Mercator co-ordinate reference system
3. Contours are at 0.25m intervals

SYMBOL LEGEND

ESB	Telecom Pole	ESB	ESB Poles
T.L.S	Lamp Standard	T.L.	Traffic Light
T. Sign	Sign	T. Sign	Traffic Sign
Corners	Corners	B	Bollard
Stay	Stay	Post	Post
Light	Light	Bin	Bin
Gas Box	Gas Box	Gas	Gas
Telecom Duct	Telecom Duct		ESB Duct
Telcom Box	Telcom Box	ESB	ESB Box
CATV	Cable TV Duct	Serv.	Service
FH	Fire Hydrant	ER	Earth Rod
Manhole & Cover Level	Manhole & Cover Level		Armstrong Junction
GY	Gully		Drain
	Tree		Bush/Shrub
	Gate	Pipe	Pipe
AV	Air Valve	SV	Sluice Valve
WV	Water Valve	WM	Water Meter
V	Valve		Spot Height
Ridge	Ridge Height	Eaves	Eaves Height
FFL	Finished Floor Level	Roof	Roof Height
Coping	Coping Height	Bdy	Boundary Height

LINE TYPE LEGEND

	Wall		Building
	Footpath		Plinth
	Concrete Edge		Step
	Fence		Mound
	Centerline of Trees		Hedge
	Drain/River		Flower Bed
	ESB Line		Telecom Line
	Kerb		Road
	Contour Major		Contour Minor
	Bottom of Bank		Top of Bank
	Yellow Line		White Line

MANHOLE LEGEND

150mmFC	Foul Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm# Foul Pipe
150mmCon	Foul Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm# Concrete Pipe
150mmGly	Combined Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm# Glay Pipe
150mmPVC	Unknown Manhole, Cover Level = 4.83, Invert Level = 2.11 & 150mm# PVC Pipe

REVISIONS

No.	Date	Description

Control Surveys
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• Topographical Surveys • As Built Surveys • Measured Building Surveys • GPS Surveys • Legal Mapping • Setting Out •

Client:

Professional:
Garland Consulting Engineers

Project Title:
Topographical Survey of Horizon Site, Dublin Road, Limerick.

Drawn:	CÓ&JÓ	**Dwg No:**	23-140-06
Scale:	1:250	**Date:**	10-03-23

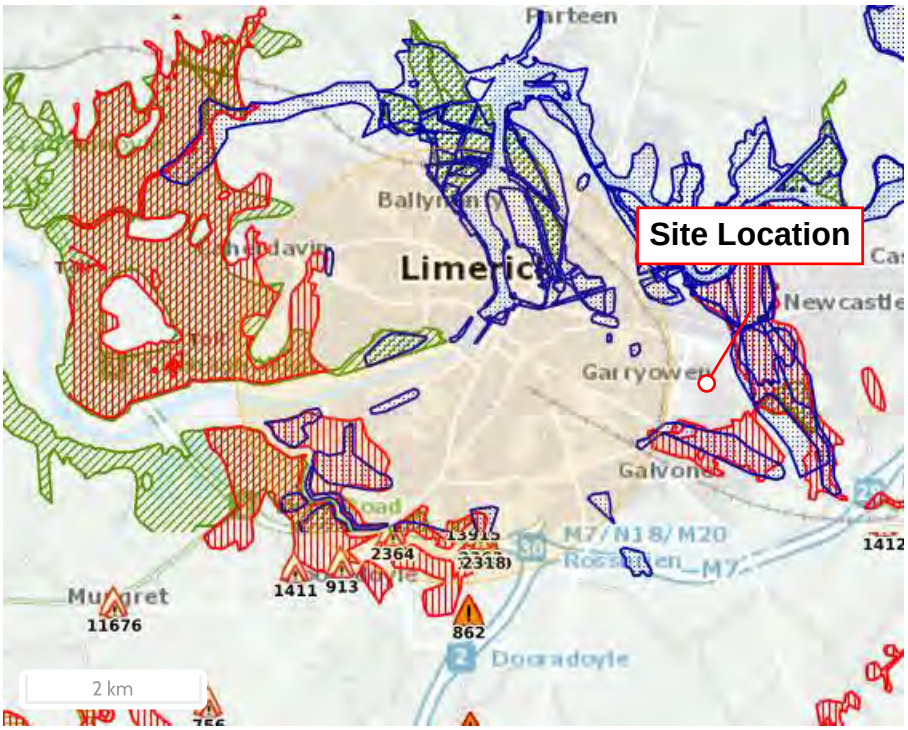
Appendix C OPW Historic Flood Events Record

Past Flood Event Local Area Summary Report

OPW Oifig na nOibreacha Poiblí Office of Public Works

Report Produced: **26/8/2024 11:42**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

69 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Flood Report for Limerick City on the 1st of February 2014 (ID-12700) **Additional Information:** Reports (1) Press Archive (0)	20/01/2014	Approximate Point
2.	St Patrick's Road Well Field Limerick Dec 1999 (ID-321) **Additional Information:** Reports (2) Press Archive (1)	25/12/1999	Area
3.	St Mary's Park Limerick Feb 2002 (ID-1625) **Additional Information:** Reports (1) Press Archive (0)	11/02/2002	Approximate Point
4.	Shannon Fields Limerick Dec 1999 (ID-318) **Additional Information:** Reports (2) Press Archive (1)	25/12/1999	Area
5.	Flooding at Limerick City on 02/01/2018 (ID-13602) **Additional Information:** Reports (0) Press Archive (0)	02/01/2018	Approximate Point
6.	Shannon Dock Road Limerick Dec 1999 (ID-301) **Additional Information:** Reports (5) Press Archive (1)	25/12/1999	Area

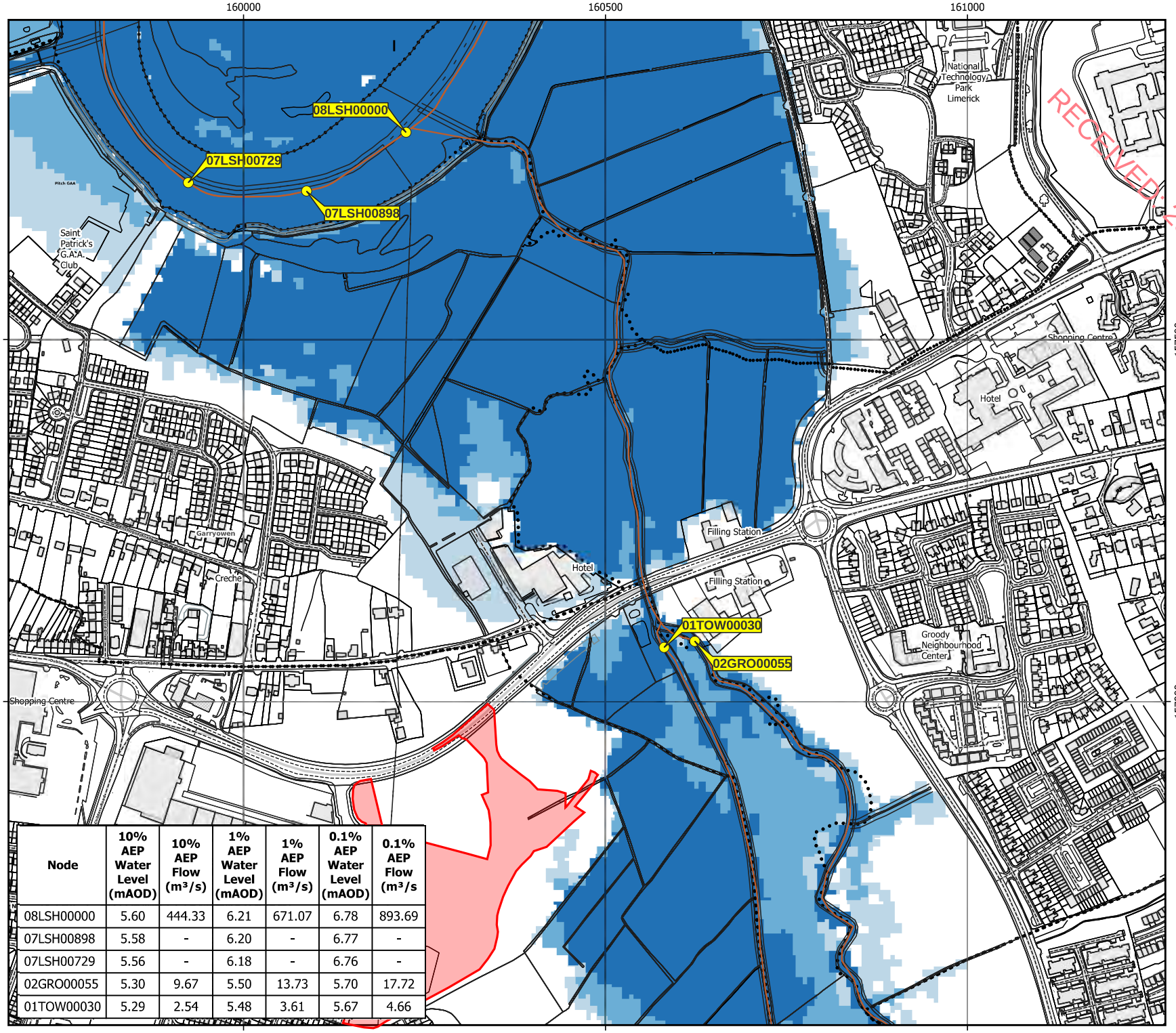
	Name (Flood_ID)	Start Date	Event Location
7.	Shannon Athlunkard St Limerick Dec 1999 (ID-314) Additional Information: Reports (10) Press Archive (1)	25/12/1999	Area
8.	Shannon December 1954 (ID-3) Additional Information: Reports (4) Press Archive (16)	01/12/1954	Area
9.	Ballynaclogh Rosbrien August 1986 (ID-2318) Additional Information: Reports (1) Press Archive (0)	04/08/1986	Approximate Point
10.	Shannon Lower Feb 1990 (ID-127) Additional Information: Reports (6) Press Archive (15)	01/02/1990	Area
11.	Clare St Limerick Dec 1999 (ID-312) Additional Information: Reports (3) Press Archive (1)	25/12/1999	Area
12.	Corrib Drive Limerick Dec 1999 (ID-297) Additional Information: Reports (3) Press Archive (1)	25/12/1999	Area
13.	Kilmurry Road Limerick Dec 1999 (ID-322) Additional Information: Reports (2) Press Archive (1)	25/12/1999	Area
14.	Shannon Westfields Limerick Dec 1999 (ID-299) Additional Information: Reports (3) Press Archive (2)	25/12/1999	Area
15.	Shannon O'Malley Park Limerick Dec 1999 (ID-305) Additional Information: Reports (3) Press Archive (1)	25/12/1999	Area
16.	Verdant Place Limerick Dec 1999 (ID-1985) Additional Information: Reports (3) Press Archive (0)	25/12/1999	Area
17.	Ballysimon Limerick Dec 1999 (ID-309) Additional Information: Reports (3) Press Archive (2)	25/12/1999	Area
18.	Clancy's Strand Limerick Feb 2002 (ID-358) Additional Information: Reports (10) Press Archive (0)	11/02/2002	Exact Point
19.	Shannon Condell Road Limerick Feb 2002 (ID-359) Additional Information: Reports (3) Press Archive (0)	11/02/2002	Approximate Point
20.	OCallaghans Strand Limerick Feb 2002 (ID-360) Additional Information: Reports (3) Press Archive (0)	11/02/2002	Exact Point
21.	Harry's Mall Limerick Feb 1997 (ID-364) Additional Information: Reports (5) Press Archive (0)	10/02/1997	Exact Point
22.	Limerick Feb 2002 - Killely (ID-1550) Additional Information: Reports (1) Press Archive (0)	11/02/2002	Approximate Point
23.	Ballynaclough River Limerick Dec 1999 (ID-1986) Additional Information: Reports (3) Press Archive (0)	25/12/1999	Area
24.	Shannon Adjacent Dock Road Limerick Dec 1999 (ID-302) Additional Information: Reports (3) Press Archive (1)	25/12/1999	Area
25.	Corrib Drive Limerick Oct 1995 (ID-3569) Additional Information: Reports (1) Press Archive (0)	24/10/1995	Approximate Point
26.	Greenfield Road Rossbrien Dec 1999 (ID-304) Additional Information: Reports (3) Press Archive (1)	25/12/1999	Area

	Name (Flood_ID)	Start Date	Event Location
27.	Shannon Ballynanty Killeely Limerick Dec 1999 (ID-316) **Additional Information:** Reports (2) Press Archive (1)	25/12/1999	Area
28.	Corbally St Mary's Pk Limerick Dec 1999 (ID-311) **Additional Information:** Reports (10) Press Archive (2)	25/12/1999	Area
29.	Clancy's Strand Harry's Mall Limerick Dec 1999 (ID-315) **Additional Information:** Reports (20) Press Archive (3)	23/12/1999	Area
30.	Healy's Field O'Briens Pk Limerick Dec 1999 (ID-310) **Additional Information:** Reports (3) Press Archive (1)	25/12/1999	Area
31.	Lee Estate Island road Limerick Feb 1997 (ID-3725) **Additional Information:** Reports (1) Press Archive (0)	10/02/1997	Approximate Point
32.	Flooding at Limerick City, Rosbrien Road (ID-13915) **Additional Information:** Reports (0) Press Archive (0)	n/a	Approximate Point
33.	Shannon Harrys Mall Limerick Feb 2002 (ID-1574) **Additional Information:** Reports (2) Press Archive (0)	11/02/2002	Approximate Point
34.	Limerick City 3rd January 2014 (ID-12380) **Additional Information:** Reports (1) Press Archive (0)	03/01/2014	Approximate Point
35.	Flooding at Limerick City on 01/10/2017 (ID-13553) **Additional Information:** Reports (0) Press Archive (0)	01/10/2017	Approximate Point
36.	Flooding at Rosbrien Road on 01/02/2019 (ID-13639) **Additional Information:** Reports (0) Press Archive (0)	01/02/2019	Approximate Point
37.	Raheen Dooradoyle, Limerick Feb 1990 (ID-541) **Additional Information:** Reports (1) Press Archive (0)	01/02/1990	Area
38.	Corbally Limerick Feb 2002 (ID-369) **Additional Information:** Reports (4) Press Archive (0)	27/02/2002	Exact Point
39.	Abbey River Athlunkard St Limerick Jan 00 (ID-375) **Additional Information:** Reports (4) Press Archive (0)	01/01/2000	Exact Point
40.	Limerick Abbey River Athlunkard area May 1994 (ID-405) **Additional Information:** Reports (4) Press Archive (0)	02/05/1994	Exact Point
41.	Clancy's Strand Limerick Jan 1994 (ID-406) **Additional Information:** Reports (6) Press Archive (0)	26/01/1994	Exact Point
42.	Clancy's Strand Limerick 17/10/2001 (ID-407) **Additional Information:** Reports (1) Press Archive (0)	16/10/2001	Exact Point
43.	Sarsfield St Arthur's Quay Limerick City Feb 1990 (ID-408) **Additional Information:** Reports (8) Press Archive (0)	21/02/1990	Approximate Point
44.	Shannon Corbally Limerick Recurring (ID-298) **Additional Information:** Reports (2) Press Archive (7)	n/a	Approximate Point
45.	Cathedral Place Limerick Recurring (ID-313) **Additional Information:** Reports (2) Press Archive (0)	n/a	Exact Point

	Name (Flood_ID)	Start Date	Event Location
46.	Ashbrook Gardens Limerick Recurring (ID-365) **Additional Information:** Reports (1) Press Archive (0)	n/a	Approximate Point
47.	South Circular Road St Mary's Limerick Recurring (ID-378) **Additional Information:** Reports (1) Press Archive (0)	n/a	Exact Point
48.	Limerick Adjacent Courthouse undated (ID-1604) **Additional Information:** Reports (1) Press Archive (0)	n/a	Approximate Point
49.	Ballynaclogh Rosbrien Recurring (ID-2363) **Additional Information:** Reports (1) Press Archive (0)	n/a	Approximate Point
50.	Ballynaclogh Ballinacurra Recurring (ID-2364) **Additional Information:** Reports (2) Press Archive (0)	n/a	Approximate Point
51.	Limerick Dock Rd Jan 1995 (ID-1563) **Additional Information:** Reports (1) Press Archive (0)	25/01/1995	Approximate Point
52.	Limerick City Clancy's Strand Feb 1990 (ID-1602) **Additional Information:** Reports (2) Press Archive (0)	01/02/1990	Approximate Point
53.	Limerick Condell Road Feb 1990 (ID-1603) **Additional Information:** Reports (2) Press Archive (0)	01/02/1990	Approximate Point
54.	Corbally Limerick Feb 1997 (ID-1605) **Additional Information:** Reports (4) Press Archive (0)	10/02/1997	Approximate Point
55.	Clancy O'Callaghan's Strand Limerick Feb 1997 (ID-1606) **Additional Information:** Reports (4) Press Archive (0)	10/02/1997	Approximate Point
56.	Condell Road Limerick Feb 1997 (ID-1607) **Additional Information:** Reports (2) Press Archive (0)	10/02/1997	Approximate Point
57.	Dock Road Bishops Quay Limerick Feb 1997 (ID-1608) **Additional Information:** Reports (3) Press Archive (0)	10/02/1997	Approximate Point
58.	Harry's Mall Limerick Feb 2000 (ID-1611) **Additional Information:** Reports (4) Press Archive (0)	08/02/2000	Approximate Point
59.	Athlunkard Street Limerick Feb 2001 (ID-1633) **Additional Information:** Reports (2) Press Archive (0)	04/02/2001	Approximate Point
60.	Flood report for Limerick City on the 1st of February 2014 (ID-12556) **Additional Information:** Reports (1) Press Archive (0)	01/02/2014	Approximate Point
61.	Limerick City 1st February 2014 (ID-12241) **Additional Information:** Reports (1) Press Archive (0)	01/02/2014	Approximate Point
62.	Custom House Quay Sarsfield St Limerick Feb 2002 (ID-1626) **Additional Information:** Reports (2) Press Archive (0)	11/02/2002	Approximate Point
63.	Shannon Limerick Dec.2006 (ID-10396) **Additional Information:** Reports (2) Press Archive (0)	01/12/2006	Area

	Name (Flood_ID)	Start Date	Event Location
64.	Clancy's O'Callaghan's Strand Limerick Jan 1995 (ID-366) **Additional Information:** Reports (2) Press Archive (1)	17/01/1995	Approximate Point
65.	Harry's Mall Limerick Jan 1995 (ID-1614) **Additional Information:** Reports (2) Press Archive (0)	17/01/1995	Approximate Point
66.	Flooding at Limerick City Hyde Rd/Lenihan Ave (ID-13918) **Additional Information:** Reports (0) Press Archive (0)	n/a	Approximate Point
67.	Flooding at Limerick City, Kilmallock Road (ID-13917) **Additional Information:** Reports (0) Press Archive (0)	n/a	Approximate Point
68.	Flooding at Limerick City, Dock Road/Atlas Avenue (ID-13919) **Additional Information:** Reports (0) Press Archive (0)	n/a	Approximate Point
69.	Flooding at Limerick City & Environs (ID-13920) **Additional Information:** Reports (0) Press Archive (0)	n/a	Approximate Point

Appendix D CFRAMS Mapping



Node	10% AEP Water Level (mAOD)	10% AEP Flow (m³/s)	1% AEP Water Level (mAOD)	1% AEP Flow (m³/s)	0.1% AEP Water Level (mAOD)	0.1% AEP Flow (m³/s
08LSH00000	5.60	444.33	6.21	671.07	6.78	893.69
07LSH00898	5.58	-	6.20	-	6.77	-
07LSH00729	5.56	-	6.18	-	6.76	-
02GRO00055	5.30	9.67	5.50	13.73	5.70	17.72
01TOW00030	5.29	2.54	5.48	3.61	5.67	4.66

100 0 100 200 300 400 Meters

Irish National Grid (EPSG: 29903). Malin Head (OSGM02 geoid)

Location Plan:

LEGEND

- Nodes
- Modelled River Centreline

10% AEP Fluvial Flood Extent
(1 in 10 Chance in any given year)

1% AEP Fluvial Flood Extent
(1 in 100 chance in any given year)

0.1% AEP Fluvial Flood Extent
(1 in 1000 chance in any given year)

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

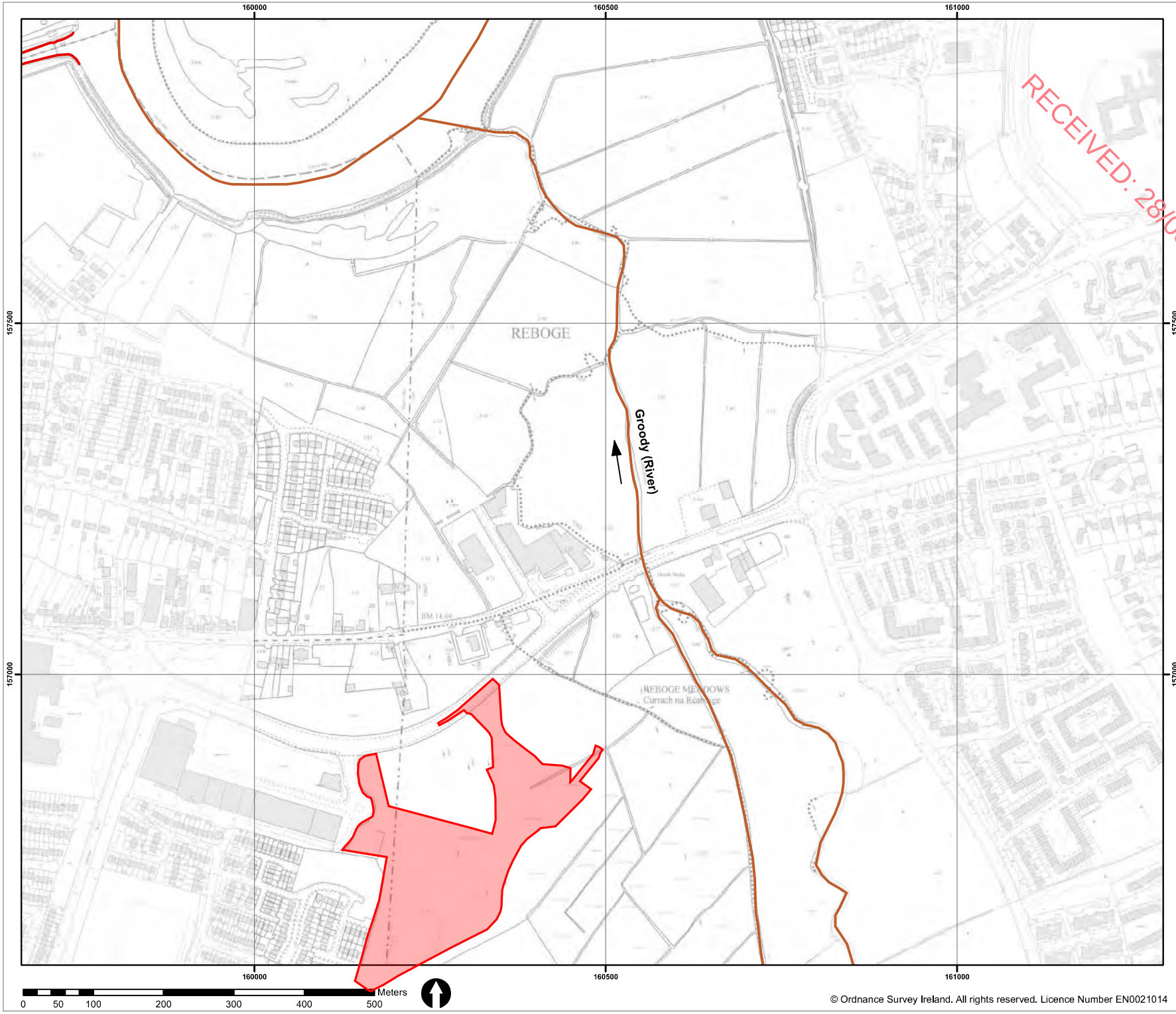
OPW Oifig na nOibreacha Poiblí Office of Public Works

The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath

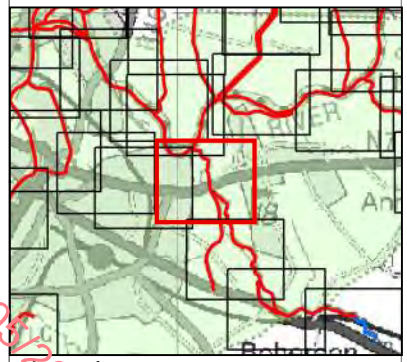
Project:
Limerick City Map Review

Map: **Limerick Fluvial Flood Extent**

Map Type:	EXTENT	
Source:	FLUVIAL	
Map Area:	HPW	
Scenario:	CURRENT	
Map Name:	s2526lik_exfcd_f1_14	
Drawn by:	KM	Date: Jul - 2023
Checked by:	CG	Date: Jul - 2023
Approved by:	CG	Date: Jul - 2023
Revision: 1		
Map Scale: 1:5,000		Plot Scale: 1:1 @ A3



Location Plan:



Legend:

- Nodes
- Model Reach
- AFA Boundary
- Flood Defence: Wall
- Flood Defence: Embankment
- Defended Area

10% AEP Coastal Flood Extent
(1 in 10 chance in any given year)

0.5% AEP Coastal Flood Extent
(1 in 200 chance in any given year)

0.1% AEP Coastal Flood Extent
(1 in 1000 chance in any given year)

IMPORTANT USER NOTE:
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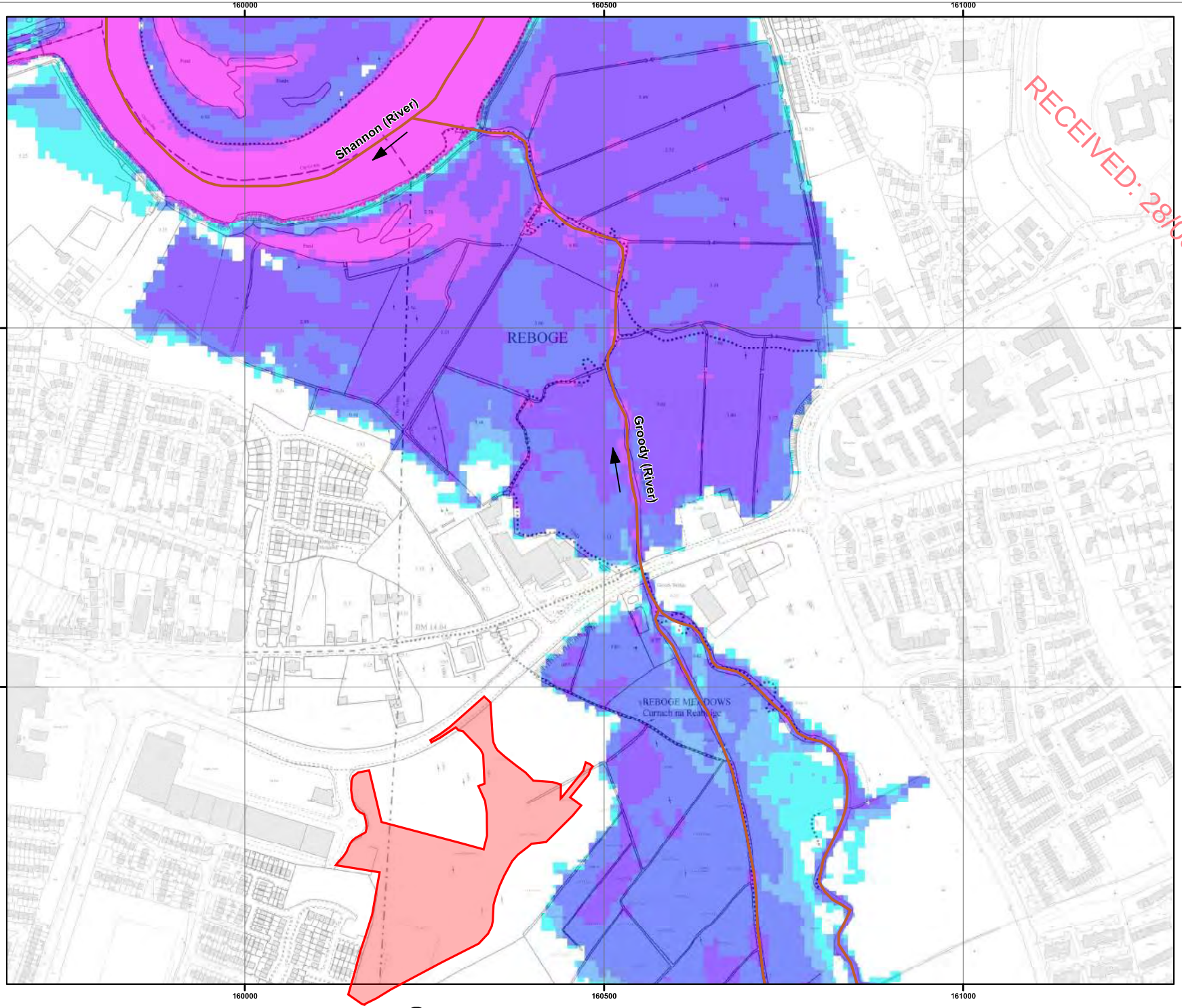
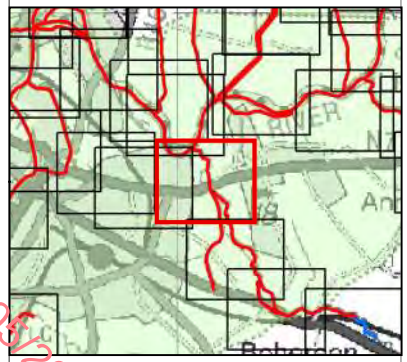
The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath
C15 NX36

Merrion House
Merrion Road
Dublin 4
D04 R2C5

Project:		SHANNON CFRAM STUDY
Map Type:		EXTENT
Source:		COASTAL - TIDAL
Area:		LIMERICK
Scenario:		EXISTING
Drawn by:	EH	Date: June 2016
Checked by:	KM	Date: June 2016
Reviewed by:	MC	Date: June 2016
Approved by:	PS	Date: June 2016
Map No.:		S2526LIK_EXCCD_F1_14
Sheet: 14 of 65		Revision: 0
Map Scale: 1: 5000		Plot Scale: 1:1 @ A3



Location Plan:



Legend

- AFA Boundary
- Model Reach

1% AEP Fluvial Flood Depth (m)

- < 0.25
- 0.25 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2.0

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

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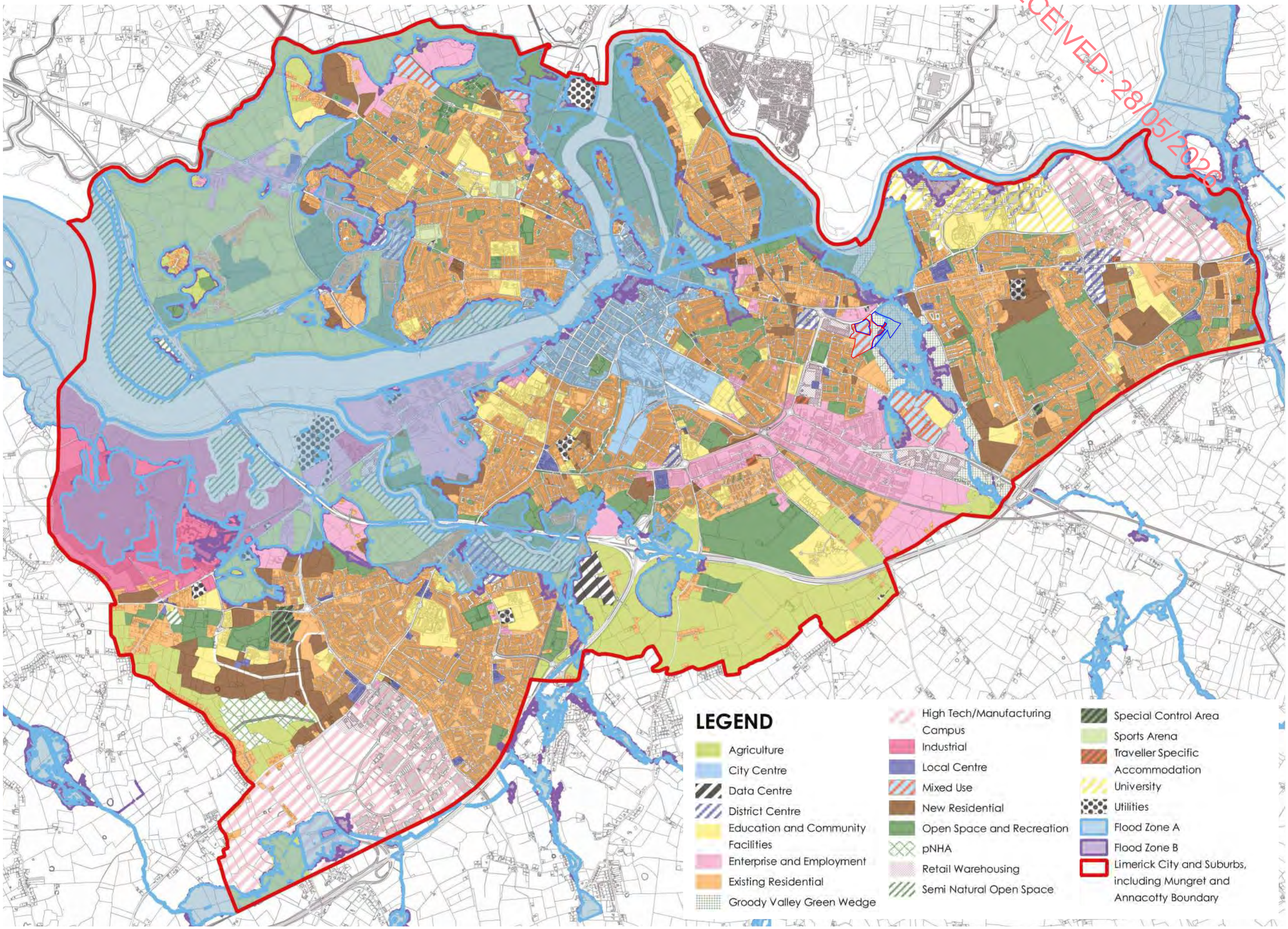
Jonathan Swift Street
Trim
Co. Meath
C15 NX36

Merrion House
Merrion Road
Dublin 4
D04 R2C5

Project:	SHANNON CFRAM STUDY
Map Type:	DEPTH
Source:	FLUVIAL
Area:	LIMERICK
Scenario:	EXISTING
Drawn by: AC	Date: June 2016
Checked by: KM	Date: June 2016
Reviewed by: MC	Date: June 2016
Approved by: PS	Date: June 2016
Map No.:	S2526LIK_DPFCD010_F1_14
Sheet: 14 of 65	Revision: 0
Map Scale: 1: 5000	Plot Scale: 1:1 @ A3

Appendix E Limerick Development Plan 2022-2028 Flood Zone Map 5

Map 5: Limerick City and Suburbs (in Limerick), including Mungret and Annacotty - Flood Map



APPENDIX 6.3

Water Framework Directive Assessment

AWN Consulting

REPORT

Water Framework Directive Assessment

Project Ref: Parkway Valley LRD EIAR

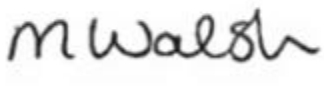
CLIENT	DOCUMENT REFERENCE	DATE
Kirkland Investments Limited	257501.0277WR02	25 May 2026

AWN Consulting Ltd, The Tecpro Building, IDA Business & Technology Park, Clonshaugh, Dublin 17, D17 XD90

DOCUMENT CONTROL SHEET

Document Control Sheet	
Our Reference	257501.0277WR02
Original Issue Date	25 May 2026
Client:	Kirkland Investments Limited
Client Address:	3rd Floor, Carlton House, Henry Street, Limerick, Co. Limerick, V94 FD80

Revision	Revision Date	Description

Details	Written by	Approved by
Signature		
Name	Megan Walsh	Marcelo Allende
Title	Environmental Consultant	Principal Hydrological Consultant
Date	25 May 2026	

Disclaimer
This report considers the specific instructions and requirements of our client. It is not intended for third-party use or reliance, and no responsibility is accepted for any third party. The provisions in this report apply solely to this project and should not be assumed applicable to other developments without review and modification.

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1. INTRODUCTION

1.1 Background

AWN Consulting (AWN), a Trinity Consultants Company, has prepared this Water Framework Directive (WFD) Assessment to support the competent authority, in determining if there is a likelihood of significant effects on the Water Framework Directive (WFD) status of the receiving waterbodies as a result of the Parkway Valley LRD on the Dublin Road (R445) in Limerick. It is proposed to develop the site to provide 403 no. residential units over 5 no. apartment blocks, a crèche and medical centre. The subject site is located approximately 2.5 km east of Limerick City centre in the Singland area.

This WFD Assessment has been prepared in response to the requirements of the Water Framework Directive 2000/60/EC. This WFD compliance document should be read in conjunction with Chapter 6 of the Environmental Impact Assessment Report (EIAR).

The objective of the assessment is to address the following:

- Does the development cause deterioration of a water body from its current status or potential for reaching "Good" status?
- Does the development impact on any water dependent protected areas, priority species, habitats etc.?
- Does the development support the achievement of water body objectives and programme of measures?

1.2 Experience of Authors

This report was prepared by Megan Walsh and Marcelo Allende.

Megan Walsh (BSc)Hons is an Environmental Consultant with experience in Environmental Impact Assessment Reporting (EIAR), Hydrological & Hydrogeological Risk Assessment, Soil Quality Assessments, surface and groundwater monitoring and geotechnical site investigations. Megan holds a B.Sc. Hons in Environmental Science from University College Cork. She is currently a member of the International Association of Hydrogeologists (IAH, Irish Group).

Marcelo Allende (BSc, BEng) is a Principal Environmental Consultant (Hydrologist) with AWN Consulting with over 20 years of experience in water resources technical studies, conceptual and numerical hydrological/hydrogeological modelling and environmental consultancy. Marcelo holds a degree in Water Resource Civil Engineering (BEng, Hons) from the University of Chile and a Bachelor of Science in Engineering (BSc, Hons). He has worked on a wide of range of projects including multi-aspect environmental investigations, geo-environmental impact assessments, surface and groundwater resource management, hydrological and hydrogeological conceptual and numerical modelling, strategic and site specific flood risk assessments (Stage 1,2 and 3), Due Diligence reporting, baselines studies, soils, surface water and groundwater monitoring and field sampling programmes on a variety of brownfield and greenfield sites throughout Ireland as well as overseas in Chile, Argentina, Peru and Panama. He is currently a member of the International Association of Hydrogeologists (IAH, Irish Group) and a member of Engineers Ireland (MIEI).

1.3 Sources of Information

Desk-based hydrological and hydrogeological information in the vicinity of the site was obtained through accessing databases and other archives where available. Data was sourced from the following:

- Geological Survey of Ireland- online mapping (GSI, 2026).
- GSI - Geological Heritage Sites & Sites of Special Scientific Interest.
- Ordnance Survey of Ireland (OSI).

- Teagasc subsoil database.
- National Parks and Wildlife services (NPWS, 2026).
- Environmental Protection Agency (EPA) – website mapping and database information. Envision water quality monitoring data for watercourses in the area.
- WFD Cycle 2 – Lower Shannon Catchment Report - Sub-Catchment: Shannon[Lower]_SC_090 (EPA, 2018).
- WFD Cycle 3 – HA 25D Lower Shannon and Mulkear Catchment Report (EPA, 2024).
- Water Action Plan 2024 - A River Basin Management Plan for Ireland, (Department of Housing Local Government & Heritage, Sept 2024).
- Limerick Development Plan 2022-2028.
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW).
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie)

Site specific data was derived from the following sources:

- Various design site plans and drawings, as submitted with the planning documentation for this application.
- Stage 2 Flood Risk Assessment, Punch Consulting Engineers, May 2026. (Appendix 6.2 of Chapter 6 of EIAR)
- Planning Engineering Report, Punch Consulting Engineers, May 2026.
- Construction Environmental Management Plan (CEMP), Punch Consulting Engineers, May 2026
- Parkway Valley Phase 1, Dublin Road, Singland, Limerick – Site Investigation, Report no. OCB25-049 (OCB Geotechnical, October 2025). (Appendix 5.2 of Chapter 5 of EIAR)
- Consultation with design architects and engineers.

Relevant legislation and guidance are as follows:

- European Communities (2003), Common Implementation Strategy for the Water Framework Directives (2000/60/EC) Guidance Document No.2.
- EPA (May 2015), An approach to characterisation as part of the Water Framework Directive V2 revised.
- EPA (2010) Methodology for Establishing Groundwater Threshold Values, the Assessment of Chemical and Quantitative Status for Groundwater and Groundwater Trends.
- Common Implementation Strategy (CIS) (2017) Guidance Document No. 36 'Exemptions to the environmental objectives according to Article 4(7) provides comprehensive guidance on the application of Article 4(7).
- Joint Assistance to Support Projects in European Regions (JASPERS) (2018) Water Framework Directive Project assessment checklist tool.
- UKTAG (2012) Groundwater Chemical Classification for the Water Framework Directive. Paper 11b(i).
- UK Technical Advisory Group on the Water Framework Directive.
- UKTAG (2012) Groundwater Quantitative Classification for the Water Framework Directive. Paper 11b(ii), UK Technical Advisory Group on the Water Framework Directive.
- Inland Fisheries Ireland (IFI) – A Guideline on Planning for Watercourses in the Urban Environment.

This WFD assessment was based on desktop review of the Environmental Protection agency (EPA) and Local Authority Waters Programme water quality records which were obtained from the portal www.catchments.ie (accessed in April 2026). From the aforementioned source of information, the WFD Status classification and Risk score were obtained for the identified water bodies.

1.4 Site Setting and WFD General Screening

The site is approximately 6.18 ha and is located in the Singland area immediately to the east of the roundabout entrance to Parkway Retail Park off the Dublin Road (R445). The site is located adjacent to the Dublin Road (R445) approximately 2.5km east of Limerick City centre. There are existing semi-

detached two storey houses and a retail park to the west, semi-detached two storey houses to the south, agricultural lands to the east, and agricultural lands, an apartment block, commercial units and an ESB substation to the north separated from the site by the Dublin Road (R445). It is proposed to develop the site to provide 403 no. residential units over 5 no. apartment blocks, a crèche and medical centre. The site entrance is proposed to be from the existing roundabout along the western boundary of the site, which currently serves as an entrance to the Parkway Retail Park mentioned above.

The subject site consists of a gravel footprint, buried concrete where the previous development was demolished in the centre, and some brownfield areas towards the southern and eastern boundaries which were likely reworked during the construction/demolition phase of the previous project. The reinforced concrete retaining walls are to be incorporated as part of the Proposed Development. The ground level of the site is elevated above the Groody River floodplain to the east. The current site sits at elevations between 5 m and 17 m above ordnance datum (AOD) Malin, with majority of the site generally flat (between 8.4 m and 9.64 mAOD) and falling to the east.

The Proposed Development site is in the Shannon (International) River Basin District (Shannon IRBD), Hydrometric Area No. 25 of the Irish River Network, and is located within the Lower Shannon Catchment (Catchment ID: 25D) and the Shannon[Lower]_SC_090 Sub-Catchment (ID: 25D_9).

This WFD Screening has identified two (2) no. WFD surface water bodies and one (1) no. WFD groundwater bodies of potential relevance due to the close proximity and connection of these waterbodies with the Proposed Development facilities.

The potential water bodies are listed in Table 1-1 below which also presents the most recent WFD Status and Risk Score for these waterbodies.

Subsequent surface waterbodies (The Upper and Lower Shannon Estuary transitional waterbodies (EU Codes: IE_SH_060_0800 and IE_SH_060_0300, respectively) and the Mouth of the Shannon and Southwestern Atlantic Seaboard coastal waterbodies (EU Codes: IE_SH_060_0000 and IE_SH_010_0000, respectively)) have been excluded from this assessment due to their significant hydrological and hydrogeological distance from the subject site.

Table 1-1: Current WFD Status and Risk Score of the Relevant Waterbodies

Waterbody	Type	Location Relative to Development	EU Code	2019-2024 Status	3rd Cycle Risk Score
Groody River	River	Adjacent	IE_SH_25S012600	Moderate	Review
River Shannon (Lower)	River	705 m d/s (linear)			
Limerick Dock	Transitional	2.97 km d/s (linear)	IE_SH_060_0900	Poor	At Risk
Limerick City East	Groundwater	Underlying	IE_SH_G_138	Good	At Risk

1.5 Legislation and Guidance

The Water Framework Directive (WFD) 2000/60/EC aims to protect and enhance the quality of the water environment (both surface water and groundwater) across all European Union member states. The WFD was transposed into Irish law by the European Communities (Water Policy) regulations 2003 (S.I. No 722 of 2003). The WFD requires that EU Member States achieve at least 'Good' status for all water bodies by the year of 2027 at the latest. Additionally, where Member States assign "High" status objectives to water bodies, the 'High' status must be achieved or maintained by 2027.

The concept of 'deterioration of the status' of a body of surface water in Article 4(1)(a)(i) of Directive 2000/60 is interpreted as meaning that there is deterioration as soon as the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if that fall does not result in a fall in classification of the body of the surface water as a whole. However, if the quality element concerned, within the meaning of that annex, is already in the lowest class, any deterioration of that element constitutes a 'deterioration of the status' of a body of surface water, within the meaning of Article 4(1)(a)(i).

As part of the WFD implementation process the EPA completes a risk assessment and the outcomes are implemented through River Basin Management Plans (RBMPs) in six-year cycles. Ireland is currently in WFD third cycle 2022-2027 i.e. Water Action Plan 2024 - A River Basin Management Plan for Ireland, (Department of Housing Local Government & Heritage, Sept 2024). Waterbodies are either 'At Risk' or 'Not at Risk' of meeting WFD environmental objectives. Where a waterbody is 'At Risk', the EPA determines the significant pressures that are placing the water body at risk of meeting its status objective. This determination focuses the Programme of Measures for the relevant Sub-catchment(s).

The primary aim of the RBMP is that water bodies identified as being 'At Risk' of not achieving their WFD environmental objectives need to have targeted measures implemented to achieve objectives under this Plan. The EPA determines the significant pressures that are placing the water body at risk of meeting its status objective. This determination focuses the programme of measures for the relevant Sub-catchment(s).

As part of its role, the EPA and other stakeholders such as local authorities must consider whether proposals for new developments (other than where exemptions apply Article 4.4 - 4.7 of the WFD) have the potential to:

- Cause a deterioration of a water body from its current status or potential; and/ or
- Prevent future attainment of good status or potential where not already achieved.

As a result, new developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the WFD objectives of the potentially affected water bodies.

1.6 Methodology

This WFD assessment is based on desktop review of the Environmental Protection Agency (EPA) dataset which was obtained from the portal www.catchments.ie (accessed in April 2026).

The water bodies identified for this assessment are related to the vicinity of the Proposed Development and its direct or indirect hydrological or hydrogeological connection. From the aforementioned source of information, the WFD Status classification, and Risk score were obtained for the identified water bodies and are presented in Table 1-1 above.

Besides the status classification of water bodies, the WFD also requires that 'designated sites' meet their environmental requirements and conservation objectives. Designated sites are Natura 2000 sites (Special Areas of Conservation, SACs, with water-dependent habitats, and Special Protection Areas for species listed in the EU Habitats Directive); drinking water protected areas; bathing waters; shellfish waters; salmonid waters; and nutrient sensitive waters. Environmental requirements and conservation objectives for designated sites are stipulated in existing regulations or are being developed by the relevant public bodies (e.g., National Parks and Wildlife Service for SACs).

1.6.1 WFD Risk Status

The WFD Risk score is the risk for each waterbody of failing to meet their WFD objectives by 2027. The risk of not meeting WFD objectives has been determined by assessment of monitoring data, data on the pressures and data on the measures that have been implemented. Waterbodies that are At Risk are

prioritised for implementation of measures. This assessment was completed in 2020 by the EPA Catchments Unit in conjunction with other public bodies and was primarily based on monitoring data up the end of 2018.

The three risk categories are:

- Waterbodies that are 'At Risk' of not meeting their Water Framework Directive objectives. For these waterbodies an evidence-based process was undertaken to identify the significant pressures, once a pressure is designated as 'significant', measures and accompanying resources are needed to mitigate the impact(s) from this pressure. These 'At Risk' waterbodies require not only implementation of the existing measures described in the various regulations, e.g., the Good Agricultural Practices Regulations, but also in many instances more targeted supplementary measures.
- Waterbodies that are categorised as 'Review' either because additional information is needed to determine their status before resources and more targeted measures are initiated or the measures have been undertaken, e.g., a wastewater treatment plant upgrade, but the outcome hasn't yet been measured/monitored.
- Waterbodies that are 'Not at Risk' and therefore are meeting their Water Framework Directive objectives. These require maintenance of existing measures to protect the satisfactory status of the water bodies.

1.6.2 WFD Water Body Status

Surface water body status is classified by the EPA on the basis of chemical and ecological status or potential. This system is summarised in Appendix A Figure 1. Under the WFD, groundwater body status is classified on the basis of quantitative and chemical status. This system is summarised in Appendix A Figure 2.

1.6.3 Surface Water No Deterioration Assessment

Table 1-2 below presents the matrix used to assess the effect of the Proposed Development on surface water status or potential class. It ranges from a major beneficial effect (i.e., a positive change in overall WFD status) through no effect to deterioration in overall status class. The colour coding used in Table 1-2 is applied to the 'No Deterioration Assessment' spreadsheet provided in Appendix B of this report.

Table 1-2: Surface Water Assessment Matrix

Effect	Description/ Criteria	Outcome
Major Beneficial	Impacts that taken on their own or in combination with others have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire waterbody	Increase in status of one or more WFD element giving rise to a predicted rise in status class for that waterbody.
Minor/ localised beneficial	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the waterbody or any quality elements	Localised improvement, no change in status of WFD element
No Impact	No measurable change to any quality elements.	No change
Localised / temporary adverse effect	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary deterioration that does not affect the overall WFD status of the waterbody or any quality elements. Consideration will be given to habitat creation measures.	Localised deterioration, no change in status of WFD element when balanced against mitigation measures embedded in the project.
Adverse effect on class of WFD element	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the WFD status class of one or more biological quality elements, but not in the overall status of the waterbody. Consideration will be given to habitat creation measures.	Decrease in status of WFD element when balanced against positive measures embedded in the project.
Adverse effect on overall WFD class of waterbody	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the ecological status or potential of a WFD quality element, which then lead to a deterioration of status/potential of waterbody.	Decrease in status of overall WFD waterbody status when balanced against positive measures embedded in the project.

1.6.4 Groundwater No Deterioration Assessment

Table 1-3 below presents the matrix used to assess the effect of the Proposed Development on groundwater status class. It ranges from a beneficial effect but no change in status to deterioration in overall status class. The colour coding used in Table 1-3 is applied to the final 'No Deterioration Assessment' spreadsheet in Appendix B of this report.

Table 1-3: Groundwater Assessment Matrix

Magnitude of Impact of the Proposed Development on WFD Element	Effect on WFD Element within the Assessment Boundary	Effect on Status of WFD Element at the Groundwater Body Scale
Impacts lead to beneficial effect	Combined impacts have the potential to have a beneficial effect on the WFD element.	Improvement but no change to status of WFD element.
No measurable change to groundwater levels or quality.	No measurable change to WFD elements.	No change and no deterioration in status of WFD element
Impacts when taken on their own have the potential to lead to a minor localised or temporary effect	Combined impacts have the potential to lead to a minor localised or temporary adverse effect on the WFD element.	Combined impacts have the potential to lead to a minor localised or temporary effect on the WFD element. No change to status of WFD element and no significant deterioration at groundwater body scale.
Impacts when taken on their own have the potential to lead to a widespread or prolonged effect.	Combined impacts have the potential to have an adverse effect on the WFD element.	Combined impacts have the potential to have an adverse effect on the WFD element, resulting in significant deterioration but no change in status class at groundwater body scale.
Impacts when taken on their own have the potential to lead to a significant effect.	Combined impacts in combination with others have the potential to have a significant adverse effect on the WFD element.	Combined impacts in combination with others have the potential to have an adverse effect on the WFD element AND change its status at the groundwater body scale

1.6.5 Assessment against Future Status Objectives

River Basin Management Plans are used to outline water body pressures and the actions that are required to address them. The future status objective assessment considers the ecological and chemical potential of a surface water body and the mitigation measures stated in the River Basin Management plans that defined the ecological and chemical potential. Assessments are based on the project (including mitigation measures) risks (construction and operation) with regard to the objectives for achieving good status as set out in the 3rd Cycle RBMP 2022-2027 i.e. Water Action Plan 2024. The assessment considers whether the Proposed Development has the potential to prevent the implementation or impact the effectiveness of the defined measures in these plans.

2. DESCRIPTION OF HYDROLOGICAL AND HYDROGEOLOGICAL ENVIRONMENT

2.1 Hydrology

The Proposed Development site is located within the Shannon (International) River Basin District (Shannon IRBD), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD). According to the EPA maps, the Proposed Development site as defined by the EPA nomenclature (EPA, 2026) is situated in Hydrometric Area No. 25 of the Irish River Network and is located within the Lower Shannon Catchment (Catchment ID: 25D) and the Shannon[Lower]_SC_090 Sub-Catchment (ID: 25D_9). The Lower Shannon Catchment encompasses an area of approximately 1041.27 km^2.

A review of EPA mapping shows two (2) no. unnamed surface watercourses within the Proposed Development site boundary flowing in an easterly direction towards an OPW arterial drainage channel c. 160 m to the east referred to by the EPA as 'Industrial Estate Galvone' watercourse. However, based on the site walkovers and surveys undertaken, these are no longer evident on the site. As stated in the Engineering Planning Report prepared by Punch Consulting Engineers (May 2026), no upstream catchments are believed to connect to these drains as all upstream sites have been developed with their own surface water networks which discharge into the main drainage network. There is an open drain at the eastern site boundary connected to Industrial Estate Galvone which ultimately discharges to the Groody River. The Groody River (EPA Code: IE_SH_25S012600), a tributary of the Shannon (Lower), is located c. 200 m to the east of the site and flows in a northerly direction.

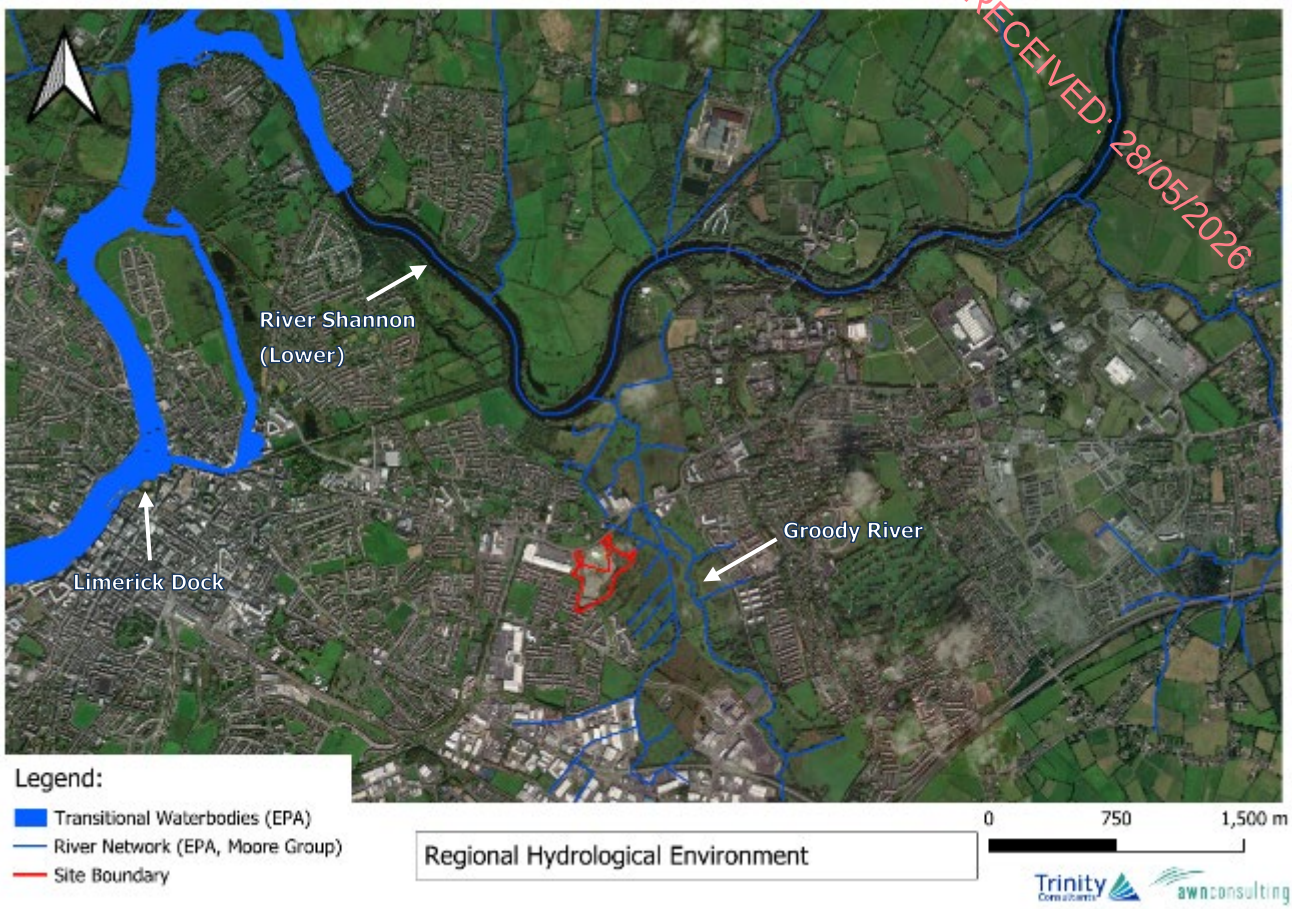
The Groody River (WFD Name: Shannon(Lower)_060) rises approx. 10 km south of the Proposed Development in Cahercornlish, Co. Limerick. Numerous streams merge into the Groody River as it flows from south to north through the Groody Valley, draining a number of Industrial Estates along the way, for approximately 1.1 km (hydrological distance) before discharging to the River Shannon (Lower) c. 705 m north-east of the site. The River Shannon (Lower) and the Groody River comprise the WFD Shannon(Lower)_060 surface waterbody.

The River Shannon rises from the Shannon Pot which drains the Cuilcagh mountains in Co. Cavan (source) from which it flows predominantly due south/southwest for approximately 260 km downstream to Limerick Dock Transitional Waterbody (EPA Code: IE_SH_060_0900) c. 2.97 km downstream of the subject development site (linear distance distance) and c. 4.6 km based on hydrological distance, flowing into the Upper Shannon Estuary (EPA Code: IE_SH_060_0800), prior to ultimately discharging into the Atlantic Ocean through the Lower Shannon Estuary (EPA Code: IE_SH_060_0300) on the west coast of Ireland via the Mouth of the Shannon between Loop Head and Kerry Head.

Figure 2-1 and Figure 2-2 below presents the local and regional hydrological environments, respectively.

Figure 2-1: Local Hydrological Environment (Source: EPA, Moore Group, 2026)

Figure 2-2: Regional Hydrological Environment (EPA, 2026)



2.1.1 Surface Water Quality

All the watercourses that drain the subject site are associated with the Shannon(Lower)_060 WFD river waterbody (European Code: IE_SH_25S012600). As mentioned above, this waterbody has a most recent WFD surface water status (WFD Period: 2019-2024) of 'Moderate' and its current WFD risk score (3rd risk cycle) is under 'Review' due to restoration of the River Blackwater which merges with the Lower River Shannon upstream of the point of mergence with the Groody River.

According to the EPA (2026), the waterbodies failed to achieve good status due to 'Moderate' ecological status or potential, and 'Pass' chemical conditions, which achieved an overall status of 'Moderate'. The chemical conditions were 'Pass' due to high nitrogen and phosphorus conditions and pass acidification and oxygenation conditions. The moderate status for the Shannon(Lower)_060 waterbody is based on modelling and is reported with 'low confidence'.

Surface water quality is monitored periodically by the EPA at various regional locations along with principal and other smaller watercourses. The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse. The biological indicators range from Q5 – Q1. Level Q5 denotes a watercourse with good water quality and high community diversity, whereas Level Q1 denotes very low community diversity and bad water quality.

The EPA online mapping presents the available water quality status information for water bodies in Ireland. Surface water quality is monitored periodically by the EPA at various regional locations along principal and other smaller watercourses. The nearest surface waterbody monitoring station along the subject catchment is situated upstream of the Proposed Development, located approximately 200 m to the east of the site (linear distance). This station is known as "GROODY - Groody Br (G1)" (Station Code:

RS25G050300) located along the Groody River. However, the most recent Q-value from this station is from 1993, recorded as 'Q3 – Poor – Moderately Polluted'. Upstream of this station, the "Br in Ballysimon (G2)" station (Station Code: RS25G050200) recorded a Q-value of 'Q3-4 – Moderate – Slightly Polluted' in 2021.

2.1.2 Areas of Conservation

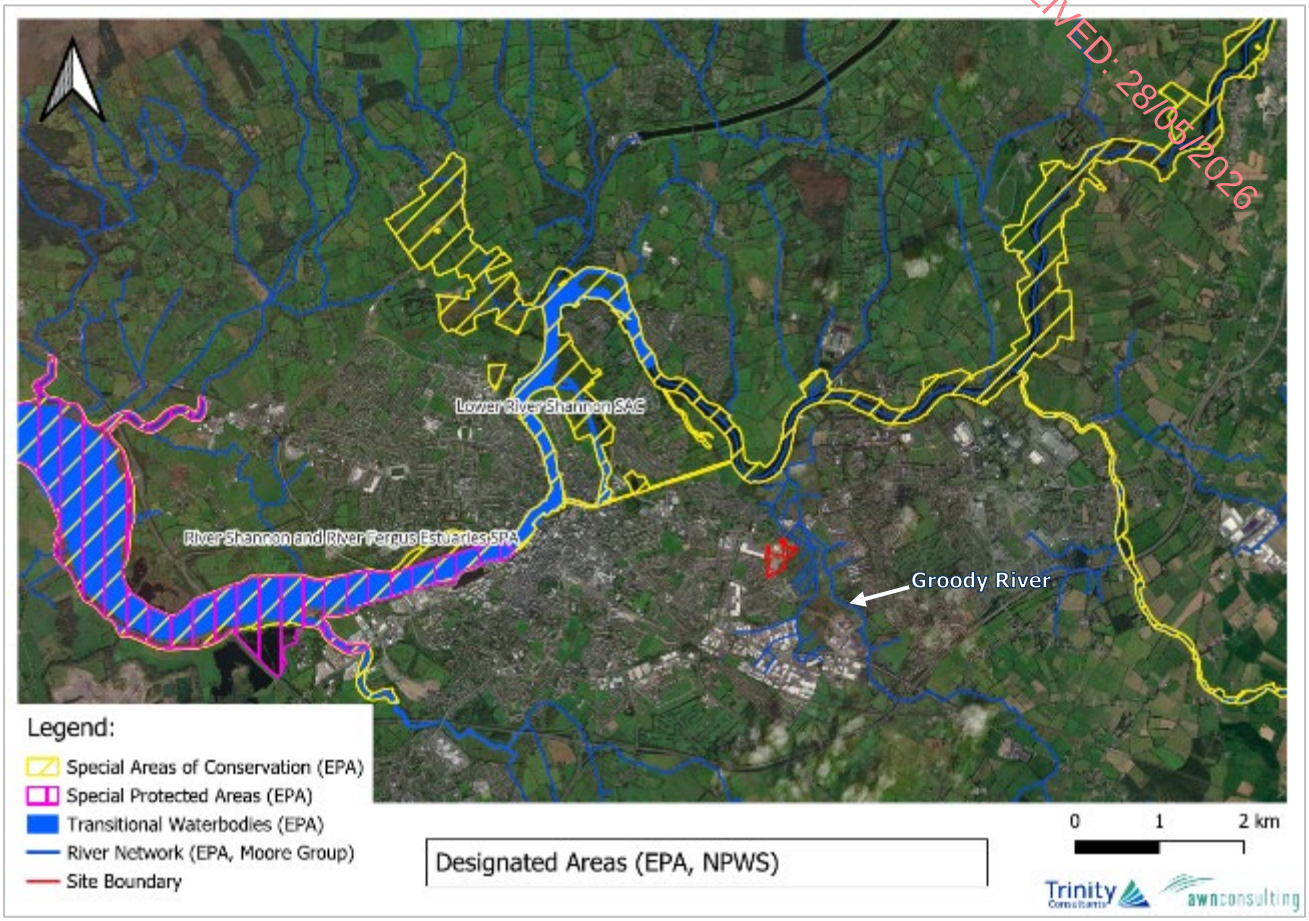
The NPWS (2026) on-line database has been reviewed to determine the location of areas of conservation in proximity to the Proposed Development site, and there are no Special Protected Areas (SPA) established under the EU Birds Directive (79/409/EEC), or Special Areas of Conservation (SAC) established under the Habitats Directive within the boundary of the Proposed Development site. Furthermore, there are no Natural Heritage Areas (NHA) established under the Wildlife Acts, 1976 and 2000 (as amended) within the boundary of the subject site.

With reference to the subject site, the nearest designated site is the Lower River Shannon SAC (Site Code: 002165), located c. 705 m north of the site (linear distance) and c. 1.4 km downstream (hydrological). The River Shannon and River Fergus Estuaries SPA (Site Code: 004077) is located within the Limerick Dock transitional waterbody (European Code: IE_SH_060_0900) and is c. 2.97 km downstream of the site based on linear distance and c. 4.6 km downstream based on hydrological distance.

The site is indirectly hydrologically connected to the Groody River. Therefore, it is expected that the Proposed Development would have an indirect hydrological connection to the above SAC and SPA through the surface water drainage from site. Although the source pathway linkage is over a significant distance allowing for attenuation and large dilution factor within the river catchment and estuary. There will also be an indirect hydrological connection the SAC and SPA sites through the wastewater effluent from the wastewater treatment plant (WWTP). However, Limerick WWTP operates under an EPA licence with defined emission limit values and compliance conditions to ensure that treated effluent discharges do not compromise the achievement of WFD environmental objectives in the receiving waterbody.

Refer to Figure 2-3 below for location of the River Shannon SAC (Site Code: 002165) and the River Shannon and River Fergus Estuaries SPA (Site Code: 004077) in relation to the Proposed Development site.

Figure 2-3: Natura 2000 Conservation & Protection Areas and Hydrological Environment (EPA and NPWS, 2026)



2.1.3 Bathing Waters and Recreational Waterbodies

A review of the Environmental Protection Agency's (EPA) online mapping that includes the Register of Protected Areas (RPA) under the Water Framework Directive (WFD) has shown that there are no Recreational Waters or Bathing Waterbodies located in the vicinity of the site. The nearest bathing waterbody is Ballycuggeran (BW ID: IESHBWL25_191a_0300) located c. 21 km north of the site, upstream of the where the Groody River merges with the River Shannon (Lower). While an indirect hydrological connection cannot be entirely discounted, the separation distance (c. 21 km) renders any such linkage highly attenuated and negligible in terms of potential impact.

2.1.4 Water Supplies

A review of the Environmental Protection Agency's (EPA) online mapping, which includes the Register of Protected Areas (RPA) established under the Water Framework Directive (WFD), indicates the Shannon(Lower)_060 WFD river waterbody is located entirely within a designated Surface Water Drinking RPA. This classification of drinking water river lines has been delineated in accordance with the European Communities (Drinking Water) (No. 2) Regulations 2007 (SI No. 278/2007). This regulatory framework aims to ensure the protection of water resources utilised for human consumption, thus safeguarding public health and the environment. The waterbody is protected under this framework due to a drinking water abstraction point upstream of the subject site in the River Shannon (Lower). The Proposed Development will have no impact on this abstraction as it is downstream from the abstraction point.

2.1.5 Water Infrastructure

A review of record drawings provided by Uisce Éireann indicates existing watermain layout in the vicinity of the site. There is a 300mm diameter ductile iron pipe which runs along the Dublin Road (R445) near the northern site boundary. The site has no existing foul loading or foul water drainage system within the site boundary as it not currently in use.

2.2 Hydrogeology

2.2.1 Groundwater Quality

According to the EPA mapping database (2026), the site is located within the Limerick City East Groundwater Body (GWB) (EU Code: IE_SH_G_138). The underlying aquifer is currently classified by the EPA as having 'Good' WFD water quality status (2019-2024 period) and is 'At Risk' (WFD 3rd Cycle). This condition is attributed to a 'Good' Quantitative Groundwater Status and 'Good' Chemical Groundwater Status (Catchments.ie, 2026).

2.2.2 Aquifer Classification and Vulnerability

The GSI (2026) classifies the principal aquifer types in Ireland as:

Bedrock Aquifer

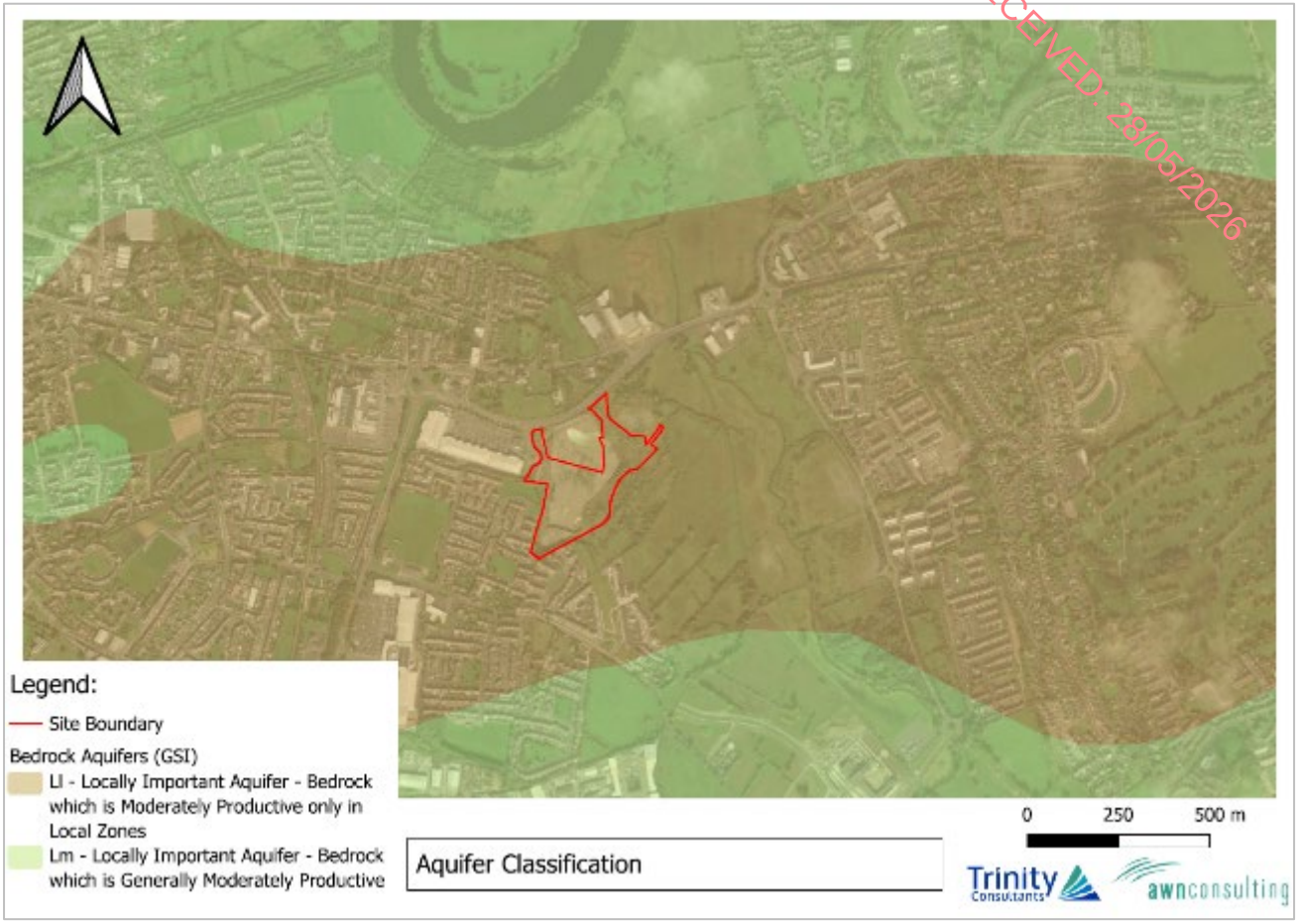
- Rkc – Regionally Important Aquifer – Karstified (conduit)
- Rkd – Regionally Important Aquifer – Karstified (diffuse)
- RK – Regionally Important Aquifer – Karstified
- Rf – Regionally Important Aquifer – Fissured bedrock
- Lm – Locally Important Aquifer – Bedrock which is Generally Moderately Productive
- Lk – Locally Important Aquifer – Karstified
- LI – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones
- PI – Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones
- PU – Poor Aquifer – Bedrock which is Generally Unproductive

Gravel Aquifer

- Lg - Locally Important Aquifer - Sand and Gravel
- Rg - Regionally Important Aquifer - Sand and Gravel

The bedrock aquifer underlying the Proposed Development site, according to the GSI (www.gsi.ie/mapping) National Draft Bedrock Aquifer Map, is classified as a "Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones" as presented in Figure 2-4 below. This aquifer is capable of supplying locally important supplies (e.g., smaller public water supplies, group schemes). The potential for vertical or horizontal migration within this type of aquifer is not significant and is on a local scale. The GSI map does not identify any structural faults underneath the subject site.

Figure 2-4: Aquifer Classification (Source: GSI, 2026)



Aquifer vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Due to the nature of the flow of groundwater through bedrock in Ireland, which is almost completely through fissures/fractures, the main feature that protects groundwater from contamination, and therefore the most important feature in the protection of groundwater, is the subsoil (which can consist solely of mixtures of peat, sand, gravel, glacial till, clays or silts). Extreme groundwater vulnerability is also associated with karst landforms as these are a direct pathway for water and contaminants to enter the aquifer from the surface.

Refer to Table 2-1 below for the Geological Survey Ireland (GSI) aquifer vulnerability ratings, which are based on subsoil permeability, thickness, unsaturated zone characteristics, and the presence of karst features.

Table 2-1: Aquifer Vulnerability

Vulnerability Rating	Hydrogeological Condition				
	Subsoil Permeability (type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/ gravel)	Moderate Permeability (e.g. sandy subsoil)	Low Permeability (e.g. clayey subsoil, clay, peat)	(Sand / gravel aquifers only)	(<30 m radius)
Extreme (E)	0 – 3 m	0 – 3 m	0 – 3 m	0 – 3 m	-
High (H)	>3 m	3 – 10 m	3 – 5 m	>3 m	n/a
Moderate (M)	n/a	>10 m	5 – 10 m	n/a	n/a
Low (L)	n/a	n/a	>10 m	n/a	n/a

Notes: (1) n/a: Not applicable
(2) Precise permeability values cannot be given at present
(3) Release point of contaminants is assumed to be 1 – 2 m below ground surface

The GSI currently denotes areas of 'Low', 'Moderate' and 'High' vulnerability across the site, as summarised below:

- An area of 'Low' groundwater vulnerability occurs beneath the eastern portion of the site and extends further east. This classification indicates that the underlying aquifer is highly protected by >10 m of low-permeability subsoil, which significantly restrict vertical water movement. This low vulnerability zone continues into tidal marshland (Teagasc, 2026), providing additional natural protection due to saturated conditions and organic-rich soils that act as a filter for potential contaminants.
- An area of 'Moderate' groundwater vulnerability underlies the central portion of the Proposed Development site. This classification indicates that the underlying aquifer is protected by >10 m of moderate permeability subsoil, typically sandy or silty deposits. These conditions provide a reasonable level of natural protection, reducing but not eliminating the potential for contaminant migration to groundwater. 'Moderate' vulnerability classification underlies the majority of the Proposed Development site.
- An area of 'High' groundwater vulnerability underlies the south-western and western portions of the site. This classification indicates limited natural protection for the underlying aquifer. In the south-western area, the aquifer is covered by approximately 3–10 m of moderate permeability subsoil, including loamy drift, glacial tills, and limestone gravels. In the western portion, protection consists of >3 m of high-permeability subsoil, which allows water and potential contaminants to move more easily toward the bedrock.

Site investigations carried out by OCB Geotechnical between July and September 2025 confirmed the thickness of made ground, overburden, and depth to bedrock within areas classified by the GSI as 'Moderate' and 'High' vulnerability. Investigations did not extend into the 'Low' vulnerability zone located in the undeveloped area in the eastern portion of the site. Recorded thicknesses ranged from 4.0-6.5 m in the central portion of the site (RC03 and RC04), 8.7 m in the north (RC02), and 3.5-4.1 m in the southern portion. These findings indicate that the underlying bedrock aquifer is moderately well protected by approximately 5-10 m of made ground and subsoil across most of the site. It should be noted that GSI vulnerability classifications are based on natural ground levels and do not account for areas that have been previously excavated or infilled, which may locally reduce aquifer protection.

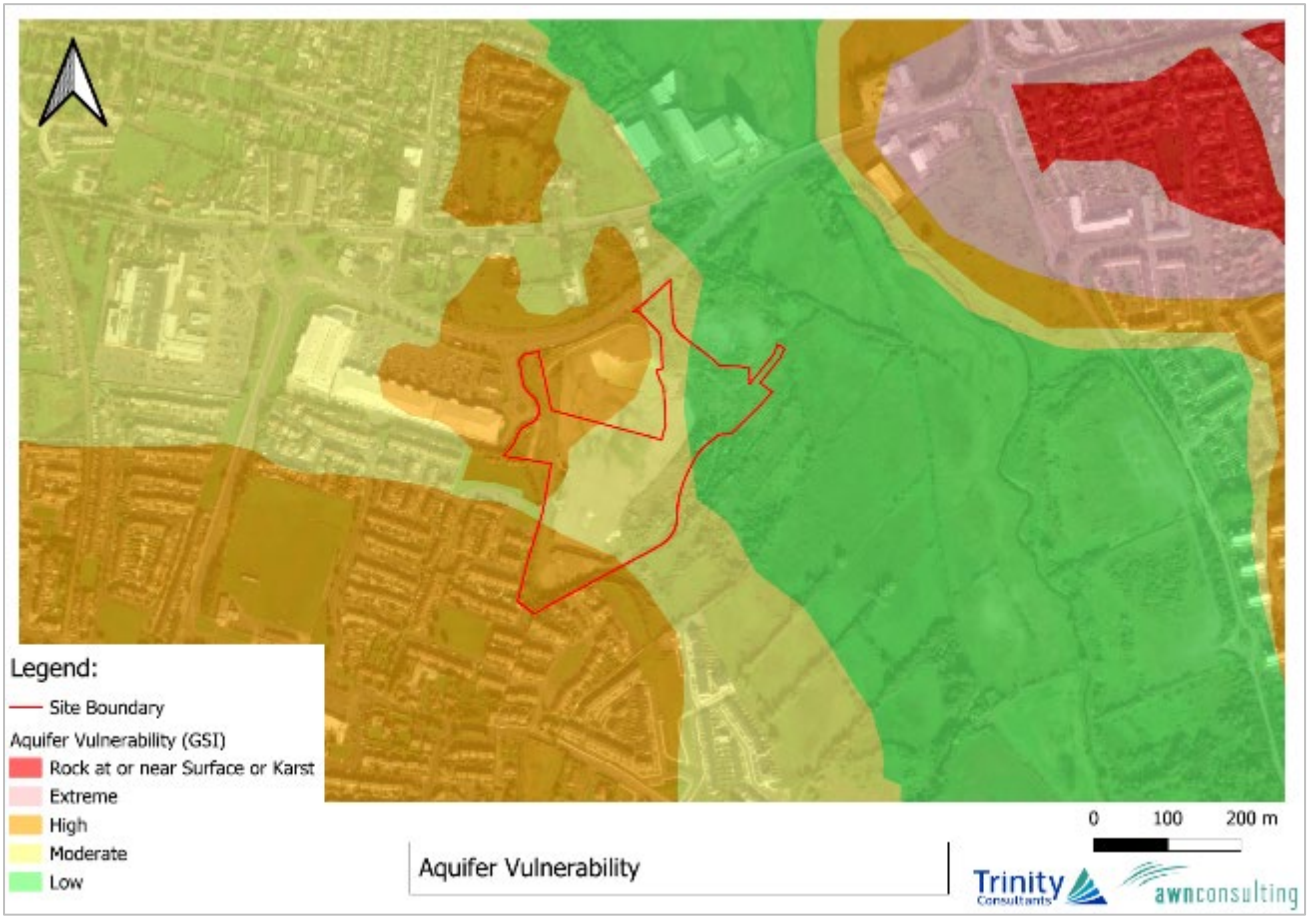
Refer to Figure 2-5 below for the aquifer vulnerability in the context of the Proposed Development site.

The Proposed Development will temporarily increase the aquifer vulnerability during construction prior to construction of foundations and other impermeable areas and installation of stormwater drainage infrastructure and services. The Proposed Development requires soil and stones to be excavated to

facilitate the construction and installation of foundations, underground car parks and services. The maximum depth of excavation will be approximately 3.75 m below current ground levels in the southern portion of the site. The excavation will extend approx. 0.25 m into the bedrock in this area, but groundwater is not expected to be encountered at this depth. From the available site investigation data, bedrock or groundwater are not expected to be encountered in any other areas across the subject site at the planned excavation depths.

Perched water was encountered in the made ground on site, retained by concrete slabs beneath the ground surface. Dewatering of the perched water within the made ground may be required. However, no significant long-term dewatering is expected. This perched water is not connected to the underlying groundwater body and as such this minor dewatering activity is unlikely to have an impact on groundwater quantity or quality.

Figure 2-5: Aquifer Vulnerability (Source: GSI, 2026)



2.2.3 Groundwater Supply

There are no recorded Public Supply Source Protection Area or Group Scheme Preliminary Source Protection Areas in the vicinity of the Proposed Development site. The nearest Group Scheme Preliminary Source Protection area is Ballybricken, located c. 9.5 km south-east of the site. The nearest Public Supply Source Protection area is Fedamore PWS located c. 12 km south of the site. Neither of these areas share a hydrological or hydrogeological connection to the site and are located within a separate catchment (Shannon Estuary South (Catchment ID: 24)).

3. WATERBODIES IDENTIFICATION AND STATUS

The Water Framework Directive (WFD) 2000/60/EC was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater, transitional (estuarine) and coastal waters. In addition to protecting said waters, its objectives include the attainment of 'Good Status' in water bodies that are of lesser status at present and retaining 'Good Status' or better where such status exists at present. 'Good Status' was to be achieved in all waters by 2015 or at least by 2027, as well as maintaining 'high status' where the status already exists. The EPA co-ordinates the activities of the River Basin Districts, local authorities and state agencies in implementing the directive, and operates a groundwater quality monitoring programme undertaking surveys and studies across the Republic of Ireland.

As presented in Section 1.4 above, this WFD Screening has identified two (2) no. WFD surface water bodies (river and transitional) and one (1) no. WFD groundwater bodies of relevance due to the close proximity and connection of these waterbodies with the Proposed Development.

In accordance with the WFD, each river catchment within the former RBD was assessed by the EPA and a water management plan detailing the programme of measures was put in place for each one. Currently, as presented in Table 1-1 above, the EPA classifies the WFD Ecological Status for the River Shannon (Lower) and its local tributaries network (Shannon(Lower)_060 WFD) waterbody as having 'Moderate' (2019-2024 cycle) with a current WFD River Waterbody risk score of 'Review' meaning that more information is required before the status can be classified. The moderate status for the Shannon(Lower)_060 waterbody is due to 'Moderate' ecological status or potential as well as 'Good' nitrogen and 'High' phosphorous status (based on modelling).

The Limerick Dock Transitional Waterbody located c. 2.97 km downstream (linear distance) of the Proposed Development Site has a 'Poor' status and a risk score of and 'At risk of not achieving good status'. As mentioned above, the Limerick Dock waterbody failed to achieve good status due to poor ecological status or potential due to high phytoplankton and poor fish status or potential, in addition to an exceedance in Phosphorous, moderate hydromorphological and high oxygenation conditions (based on monitoring).

The main pressures associated with the Shannon (Lower) Sub-catchment (Shannon[Lower]_SC_090) are hydromorphology and agriculture, based on the WFD Cycle 2 report produced by the EPA in December 2018 and the 3rd Cycle Lower Shannon and Mulkear Catchment Report (HA25D) (EPA, 2024).

There is an existing indirect hydrological pathway between the Proposed Development Site and these surface waterbodies through the site drainage that ultimately discharges into the Groody River which merges the River Shannon which in turn outfalls into the Atlantic Ocean via the Upper and Lower Shannon Estuaries.

As mentioned in Section 1.4 above, the groundwater body (GWB) underlying the site is the Limerick City East GWB (European Code: IE_SH_G_138). Based on the most recent data (www.epa.ie), this GWB (which the site is located entirely within) has a WFD status of 'Good' (WFD Period: 2019-2024) and a WFD risk score (3rd Cycle) of 'At Risk' of not achieving good status.

Limerick WWTP is underlain by Limerick City Southwest Groundwater Body which currently has 'Good' WFD status (2019-2024) and is 'At Risk' of not achieving 'Good' status by 2027. The facility is underlain by low permeability estuarine silts and clays (cohesive deposits) and a Locally Important Bedrock Aquifer which is Generally Moderately Productive, classified as having low vulnerability. The effluent is unlikely to impact the status of the groundwater body as it is treated as per the requirements associated with the facility's license. Additionally, there is low likelihood of discharge to groundwater through this pathway due to the low permeability cohesive material underlying the area and the infrastructure associated with the WWTP discharge process. Based on this, the Limerick Southwest groundwater body has been excluded from the linkage assessment discussed in Section 5.

Figure 3-1 to Figure 3-3 below summarise the water quality of the aforementioned waterbodies.

Figure 3-1: Water Quality for Shannon(Lower)_060 Surface Waterbody (EPA, 2026)

Waterbody: SHANNON (LOWER)_060

Name:	SHANNON (LOWER)_060	Code:	IE_SH_25S012600
Subcatchments:	25D_3 Shannon[Lower]_SC_100 25D_9 Shannon[Lower]_SC_090	Catchments:	25D Lower Shannon
Latitude:	52.6839205	Longitude:	-8.5503104
Cycle 1 RBD:	Shannon	Local Authority:	Limerick City & County Council
Waterbody Category:	River	WFD Risk:	Review
Protected Area:	Yes	High Status Objective:	No
Heavily Modified:	Unknown	Artificial:	Unknown
Area (Km^2):	N/A	Length (Km):	60.21
Transboundary:	No	Canal:	No

SW 2019-2024

Status	Assessment Technique	Status Confidence	Value
▾ Ecological Status or Potential	Modelling	low confidence	Moderate
▾ Supporting Chemistry Conditions			Pass
▾ General Conditions			Pass
▾ Oxygenation Conditions			Pass
Dissolved Oxygen (% Sat)			Pass
Other determinand for oxygenation conditions			High
▾ Acidification Conditions			Pass
pH			Pass
▾ Nutrient Conditions			Pass
▾ Nitrogen Conditions			Good
Nitrate			Good
Ammonium			High
▾ Phosphorous Conditions			High
Orthophosphate			High
Specific Pollutant Conditions			Pass

Figure 3-2: Water Quality for Limerick Dock Transitional Waterbody (EPA, 2026)

Waterbody: Limerick Dock

Name:	Limerick Dock	Code:	IE_SH_060_0400
Catchments:	24 Shannon Estuary South 25D Lower Shannon		
Latitude:	52.66529	Longitude:	-8.63063
Cycle 1 RBD:	Shannon	Local Authority:	Limerick City & County Council
Waterbody Category:	Transitional	WFD Risk:	At risk
Protected Area:	Yes	High Status Objective:	No
Heavily Modified:	Yes	Artificial:	No
Area (Km^2):	3.30	Length (Km):	N/A
Transboundary:	No		

SW 2019-2024

Status	Assessment Technique	Status Confidence	Value
▾ Ecological Status or Potential	Monitoring	high confidence	Poor
▾ Biological Status or Potential			Poor
Phytoplankton Status or Potential			High
Fish Status or Potential			Poor
Hydromorphological Conditions			Moderate
▾ Supporting Chemistry Conditions			High
▾ General Conditions			High
▾ Oxygenation Conditions			High
Dissolved Oxygen (% Sat)			High
Other determinand for oxygenation conditions			High
▾ Nutrient Conditions			Good
Other determinand for nutrient conditions			Good
▾ Phosphorous Conditions			High
Orthophosphate			High
Specific Pollutant Conditions			Pass

Figure 3-3: Water Quality for Limerick City East Ground Waterbody (EPA, 2026)

Waterbody: Limerick City East

Name:	Limerick City East	Code:	IE_SH_G_138
Catchments:	24 Shannon Estuary South 25D Lower Shannon		
Latitude:	-8.5596907	Longitude:	52.6499967
Cycle 1 RBD:	Shannon	Local Authority:	Limerick City & County Council
Waterbody Category:	Groundwater	WFD Risk:	At risk
Protected Area:	N/A	High Status Objective:	No
Heavily Modified:	N/A	Artificial:	N/A
Area (Km^2):	N/A	Length (Km):	N/A
Transboundary:	No	Canal:	No

GW 2019-2024

Status	Assessment Technique	Status Confidence	Value
▾ Overall Groundwater Status			Good
▾ Quantitative Groundwater Status			Good
Saline (or Other) Intrusions Test			Good
Impact of Groundwater on Surface Water Ecological/Quantitative Status Test			Good
Groundwater Dependent Ecosystems (GWDTE) - Quantitative Assessment Test			Good
Water Balance Test			Good
▾ Chemical Groundwater Status			Good
Saline (or Other) Intrusions Test			Good
Impact of Groundwater on Surface Water Ecological/Chemical Status Test			Good
Groundwater Dependent Ecosystems (GWDTE) - Chemical Assessment Test			Good
Drinking Water Protected Area Test			Good
General Chemical Assessment Test			Good

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The purpose of this section is to provide an overview of the key relevant details of the construction phase and operational phase of the Proposed Development. The information presented in this section is informed by the project design, but it is not a complete description of the development. Therefore, it should be read in conjunction with the full development package.

The site is approximately 6.18 ha and is located in the Singland area immediately to the east of the roundabout entrance to Parkway Retail Park off the Dublin Road (R445). The site is located adjacent to the Dublin Road (R445) approximately 2.5km east of Limerick City centre. There are existing semi-detached two storey houses and a retail park to the west, semi-detached two storey houses to the south, agricultural lands to the east, and agricultural lands, an apartment block, commercial units and an ESB substation to the north separated from the site by an existing road Dublin Road (R445). It is proposed to develop the site to provide 403 no. residential units over 5 no. apartment blocks, a crèche and medical centre. The site entrance is proposed to be from the existing roundabout along the western boundary of the site, which currently serves as an entrance to the Parkway Retail Park mentioned above.

A comprehensive understanding of the Proposed Development will be provided in Chapter 2 'Description of the Proposed Development' of the EIA Report. Chapter 2 will provide a detailed overview of the lifecycle of the project, including reference to the architectural and civil engineering, drawings, plans, reports, and other relevant document in order to define the Proposed Development.

4.1 Construction Phase

The activities required for the construction phase of the Proposed Development represents the greatest risk of potential impact on the hydrological and hydrogeological environment. These activities primarily pertain to the site preparation, excavation and infilling activities required to facilitate construction of the Proposed Development.

The Construction Environment Management Plan (CEMP) prepared by Punch Consulting Engineers (May 2026) gives an indication of the likely construction sequence:

1. Clearance and preparation of site for development
2. Demolition and removal of existing concrete floor slab
3. Construction of earthworks including surface water detention pond
4. Construction of foundations – anticipated piles/ground beams
5. Construction of reinforced concrete floor slab
6. Site services construction including surface/foul water sewers, watermain and M&E services
7. Construction of concrete frame
8. Construction of floors and roof
9. Facades
10. Construction of roads/carpark/retaining elements
11. Fit out
12. Landscaping

The Proposed Development requires soil and stones to be excavated to facilitate the construction and installation of foundations, underground car parks and services. The elevation across the majority of the site is expected to remain similar to current levels once construction activities are complete.

The Proposed Development requires soil and stones to be excavated to facilitate the construction and installation of foundations, underground car parks and services. The consultants at Mitchell McDermott have estimated that c. 41,275 m^3 of material will need to be excavated. An estimated volume of 37,350.7

m^3 will be required for infilling. The potential to reuse excavated material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material. It is currently envisaged that around 10% of the excavated material, c. 4,127.5m^3, will be retained and reused onsite for landscaping and fill. Any material that is not reused will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

During the OCB geotechnical site investigation works perched water was found to be retained by the made ground. The OCB Geotechnical report states that the coarser grain size of the made ground materials in comparison to the underlying finer grained native soils as well as the presence of underground concrete slabs within the made ground are likely to be facilitating storage of the perched water within the made ground. Dewatering of the perched water within the made ground will be required. However, no significant long-term dewatering is expected as this perched water is not connected to the natural hydrogeological regime. This minor dewatering activity is unlikely to have an impact on groundwater quantity or quality.

While there is potential for run-off water to become contaminated with pollutants accidentally released during construction activity, there is low potential for groundwater to become locally contaminated with pollutants associated with construction activity as the aquifer vulnerability is a combination of 'low' (east), 'moderate' (centre and south) and 'high' (west and southwest) vulnerability across the site, with bedrock depths ranging from 4.0-6.5 m (centre), 8.7 m (north), and 3.5-4.1 m (south) below ground level.

The potential main contaminants include:

- Pollution due to discharges or spillages during the construction phase:
  - Cement/concrete (increase turbidity and pH) – arising from construction materials.
  - Hydrocarbons (ecotoxic) – accidental spillages from construction plant or onsite storage.
  - Wastewater (nutrient and microbial rich) – arising from accidental discharge from on-site toilets and washrooms.

The aquifer vulnerability will increase during construction prior to construction of foundations and other impermeable surfaces and the installation of stormwater drainage and services due to the excavations required in some areas to facilitate construction. The area which requires the most excavation is classified as 'High' vulnerability by the GSI.

The gradual introduction of impermeable surfaces across the construction site will reduce the infiltration capacity and increase the rate and volume of direct surface run-off. The potential impact of this is a possible increase in surface water run-off along with sediment loading, which could potentially impact local drainage if not adequately mitigated. This increase in the rate and volume of direct surface run-off can result in increased sediment loading, scouring impacts on local drainage and watercourses, and downstream impacts. Prior to the installation of the proposed drainage system there may be a resultant minor increase in flow to offsite drainage.

There are no surface water or groundwater abstractions proposed, therefore no potential impacts on the quantity of surface water or groundwater. There are no proposed diversions of any drainage ditches or waterbodies as part of the Proposed Development. There are no potential impacts from wastewater on the hydrological and hydrogeological environment as this will be collected and discharged of appropriately.

At a minimum, the works will be carried out according to standard best international practice including, but not limited, to:

- CIRIA, (2001), *Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532)* Construction Industry Research and Information Association
- CIRIA (2002) *Control of water pollution from construction sites: guidance for consultants and contractors (SPI56)* Construction Industry Research and Information Association
- CIRIA (2005), *Environmental Good Practice on Site* (C650); Construction Industry Research and Information Association

- BPGCS005, *Oil Storage Guidelines*
- CIRIA 697 (2007), *The SUDS Manual*; and *UK Pollution Prevention Guidelines*, (PPG) UK Environment Agency, 2004.

During construction, the contractor will be required to operate in full compliance with the CEMP prepared by Punch Consulting Engineers (May 2026), all construction phase mitigation measures set out in the EIAR, and any conditions attached to the planning permission, once granted.

4.2 Operational Phase

The activities for the operational phase of the Proposed Development which relate to the hydrological and hydrogeological environment during operation are summarised below.

The Proposed Development does not require any bulk storage of oil/fuel.

There will be no requirement for further excavations during the operational phase other than for normal landscaping purposes.

Surface water discharge from the subject site will be managed and controlled in order to have minimal impact on the current drainage environment. The development will result in an increase in hardstand; however, permeable paving will be implemented on site as part of the sustainable drainage system.

The surface water network will be separate from the foul sewer network. Surface water runoff from the development will be passed through various Sustainable Urban Drainage System (SuDS) devices before passing through a flow control device (hydrobrake) which will replicate the greenfield runoff rates (Qbar) located upstream of the outfall point that discharges into an open drain which flows into Industrial Estate/Galvone Stream, ultimately discharging to the Groody River.

The SuDS design includes green roofs, rain gardens, infiltration trenches, engineered swales, tree root systems, permeable paving and an attenuation pond. The inclusion and incorporation of SuDS will reduce run-off volumes and improve run-off water quality, with discharge rates from site being restricted to the greenfield equivalent runoff rate and provide a surface water management train and promote source control throughout the development while also providing attenuation storage at source.

A new foul water sewer network shall be provided for the Proposed Development which will be entirely separate from the storm water network. It is proposed that the foul sewer will be collected in a new foul pumping station located to the east of the site and then pumped via a new rising main before discharging into the existing drainage in the Parkway Retail Park which ultimately discharges into a combined sewer on Childers Road. A Pre-Connection Enquiry (PCE) was submitted to Uisce Éireann on 9th June 2025, and a Confirmation of Feasibility (COF) was received from Uisce Éireann on 30th October 2025 which confirms the feasibility of the proposed water supply and wastewater connections (COF Ref. DS25006639). The watermain connection will require infrastructure upgrades to be funded by the Applicant. Wastewater from the Proposed Development will ultimately be discharged to Limerick WWTP (D0013), where it will be treated. According to Uisce Eireann's 2022 Annual Environmental Report (AER), WWTP currently has adequate operational capacity to accommodate the additional flows generated by the Proposed Development. Following treatment, the final effluent from Limerick WWTP is discharged into Limerick Dock transitional waterbody.

5. ASSESSMENT OF SOURCE-PATHWAY-RECEPTOR (SPR) MODEL

A conceptual site model is developed based on a good understanding of the hydrological and hydrogeological environment, plausible sources of impact and knowledge of receptor requirements. This in turn allows possible Source Pathway Receptor (S-P-R) linkages to be identified. If no S-P-R linkages are identified, then there is no risk to identified receptors.

The Proposed Development site is located in the Shannon (International) River Basin District (Shannon IRBD) (Hydrometric Area No. 25), within the Lower Shannon Catchment (Catchment ID: 25D) and the Shannon[Lower]_SC_090 Sub-Catchment (Sub-Catchment ID: 25D_9).

As stated in Section 3 above, the site is underlain by the Limerick City East Groundwater Body (GWB) (European Code: IE_SH_G_138), which has been investigated by the GSI and is described as a 'Locally Important Aquifer'. The majority of groundwater flow in this aquifer will occur in the top few metres, through the weathered zone in a lateral direction towards rivers and springs, as well as through, joints and fractures, rather than through the rock mass according to the Limerick City East Groundwater Body Report (GSI, 2026)

The Proposed Development will temporarily increase the aquifer vulnerability during construction prior to construction of foundations and other impermeable areas and installation of stormwater drainage infrastructure and services. The Proposed Development requires soil and stones to be excavated to facilitate the construction and installation of foundations, underground car parks and services. The maximum depth of excavation will be approximately 3.75 m below current ground levels in the southern portion of the site. The excavation will extend approx. 0.25 m into the bedrock in this area, but groundwater is not expected to be encountered at this depth. From the available site investigation data, bedrock or groundwater are not expected to be encountered in any other areas across the subject site at the planned excavation depths.

Dewatering of the perched water within the made ground may be required. However, no significant long-term dewatering is expected. This perched water is not connected to the underlying groundwater body and as such this minor dewatering activity is unlikely to have an impact on groundwater quantity or quality.

The site is indirectly hydrologically connected to the Lower River Shannon SAC (Site Code 002165) through its local drainage network. The site is indirectly connected to the Groody River via drainage to the Industrial Estate/Galvone Stream adjacent to the site (via an open drain). The Groody River merges with the River Shannon (Lower) and, hence the River Shannon SAC c. 1.4 km (hydrological distance) downstream of the site.

There is also an 'indirect' hydrological connection with the Limerick Dock transitional waterbody through the proposed foul sewer connection to Limerick WWTP (Reg: D0013), located upstream of the subject site (post treatment and in accordance with EPA licence conditions). As there will be capacity available at Limerick WWTP, no potential impacts are anticipated on the Limerick Dock transitional waterbody (or any subsequent transitional/coastal waterbodies) or the underlying Limerick City Southwest GWB.

River Shannon and River Fergus Estuaries SPA (Special Protected Areas Site Code: 004077) is located c. 2.97 km downstream of the site (linear distance). However, the source pathway linkage is over a significant distance allowing for significant attenuation and large dilution factor within the river catchment and estuary and hence, this Natura 2000 site has been excluded from this assessment. There will also be a hydrological connection the SAC and SPA sites through the wastewater effluent from the wastewater treatment plant (WWTP). However, Limerick WWTP operates under an EPA licence with defined emission limit values and compliance conditions to ensure that treated effluent discharges do not compromise the achievement of WFD environmental objectives in the receiving waterbody.

There are no Recreational Waters or Bathing Waterbodies located in the vicinity of the site.

If not mitigated, contaminated water can pose a temporary risk to the local drainage network connected to the Groody River and River Shannon (Shannon (Lower)_060 river waterbody), Limerick Dock transitional waterbody (2.97 km from the site, linear distance), and the underlying 'Locally Important Aquifer' i.e. the Limerick City East GWB.

Table 5-1 below describes the S-P-R model for the Proposed Development site and includes the robust mitigation and design measures which will be incorporated into the Proposed Development throughout the construction phases.

Table 5-1: Pollutant Linkage (S-P-R) Assessment

Source	Pathway	Receptor	Risk of Impact	Mitigation/Design Measures
Construction Impacts (summary)				
Unmitigated leak from an oil tank to ground/ unmitigated leak from construction vehicle (1,000 litres worst case scenario). Discharge to ground of runoff water with: • High pH from cement process. • Hydrocarbons from construction vehicles. • Run-off containing a high concentration of contaminated suspended solids.	Vertical migration through contaminated overburden to underlying "Locally Important Aquifer" (Ll), classified across the majority of the site by the GSI as having a 'Moderate' vulnerability. Excavations will temporarily increase the aquifer vulnerability. Lateral migration via groundwater within the underlying 'Locally Important' Bedrock Aquifer to the hydrological environment i.e. Shannon(Lower)_060 WFD surface waterbody, Limerick Dock transitional waterbody and subsequent transitional/coastal waterbodies.	Underlying 'Locally Important Aquifer' Bedrock Aquifer' (Limerick City East GWB). River Shannon SAC Shannon(Lower)_060 River Waterbody (adjacent to site) Limerick Dock Transitional Waterbody (c. 2.97 km linear distance from the site)	No likely impact on the status of the Limerick City East GWB (Locally Important Aquifer) due to low potential loading, shallow depth of excavations (max. 0.25m) and mitigation measures during construction (refer to CEMP). No likely impacts on the status of the Surface Waterbodies (river, transitional and coastal) due to low potential loading and mitigation measures in place (refer to CEMP). In addition, dilution is expected in the Groody River.	Only potential for temporary impacts due to accidental releases. Mitigation measures outlined in a CEMP which will be a live document. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the CEMP and any subsequent conditions relevant to the Proposed Development. These include management of soils, re-fuelling of machinery and chemical handling, control of water during the construction phase and treatment of discharge water where required.

Source	Pathway	Receptor	Risk of Impact	Mitigation/Design Measures
Operational Impacts (summary)				
Discharge to ground of hydrocarbons from roads, car parking, and hardstanding areas. Discharge of foul water to the Limerick WWTP (Reg: D0013).	Indirect pathway to River Shannon and associated SAC, and Limerick Dock Transitional Waterbody through the proposed foul sewer connection (post treatment) at Limerick WWTP (Reg: D0013). Indirect pathway through stormwater drainage to the Shannon(Lower)_060 WFD surface waterbody (via River Groody) and eventually to the River Shannon, Limerick Dock transitional waterbody and subsequent transitional/coastal waterbodies. Lateral migration via groundwater within the underlying 'Locally Important' Bedrock Aquifer to the hydrological environment i.e. Shannon(Lower)_060 WFD surface waterbody, Limerick Dock transitional waterbody and subsequent transitional/coastal waterbodies.	Underlying 'Locally Important Aquifer' Bedrock Aquifer' (Limerick City East GWB). River Shannon SAC Shannon(Lower)_060 River Waterbody (adjacent to site) Limerick Dock Transitional Waterbody (c. 2.97 km linear distance from the site)	No perceptible risk due to the implementation of the design measures which includes SuDS and the use of interceptors along the drainage system. Furthermore, the extent of loading of contaminant, distance between the source and the receptors along with significant dilution in the drainage network will ensure any released hydrocarbons and other contaminants are at background levels (i.e., with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019). No perceptible risk to the hydrological or hydrogeological environment following treatment in the EPA licenced Limerick WWTP (Reg: D0013).	The Proposed Development is designed to ensure the protection of the hydrological and hydrogeological environment by incorporating SuDS measures in design including permeable paving, attenuation system, petrol interceptor, among others. These features will effectively manage surface water flows, directing them to the attenuation system to maximize their storage potential. A flow control device will be installed downstream of the pond's outlet pipe to ensure that surface water runoff is stored efficiently before entering the downstream network, i.e. the Shannon(Lower)_060 surface waterbody. Wastewater discharge to be agreed with Uisce Éireann in a Wastewater Connection Application.

6. NO-DETERIORATION ASSESSMENT

6.1 Hydrological Environment

As stated in Section 5 above, at present there is a hydrological connection with the River Shannon SAC through the local surface water drainage system. There is an 'indirect' hydrological connection with the Groody River which merges with the River Shannon (Lower) (c.705 m northeast of the Proposed Development site) through the surface water drainage.

Mitigation measures will be implemented during construction (as set out in the CEMP) and operational design measures (SuDS) will ensure there are no potential impacts on the hydrological environment. This is a lengthy hydrological pathway from the site, through the surface water drainage system to the Industrial Estate/Galvone Stream and the Groody River, before reaching the River Shannon (Lower), where the SAC is located allowing for significant dilution and settlement should an accidental release occur. Therefore, no potential impacts are anticipated during construction and operation in the receiving waterbodies.

There is also an 'indirect' hydrological connection with the River Shannon SAC through the proposed foul sewer connection to Limerick WWTP (Reg: D0013), located along Limerick Dock transitional waterbody downstream of the subject site. This WWTP is required to operate under an EPA licence (D0013) and meet environmental legislative requirements as set out in such a licence (Uisce Éireann, 2026). Therefore, the water will be discharged post-treatment and in accordance with EPA licence conditions. According to Uisce Eireann's 2022 Annual Environmental Report (AER), WWTP currently has adequate operational capacity to accommodate the additional flows generated by the Proposed Development. Following treatment, the final effluent from Limerick WWTP is discharged into Limerick Dock transitional waterbody.

During construction, there are mitigation and design measures which will be implemented to protect the hydrological (and hydrogeological) environment. There is a potential of accidental discharges should mitigation fail during the construction phase, however these are temporary short-lived events that will not impact on the water status of waterbodies long-term and as such will not impact on trends in water quality and over all status assessment. The project-specific Construction and Environmental Management Plan (CEMP) which is included with the planning documentation, includes strict mitigation measures which will be implemented by the contractor to ensure the protection of the hydrological (and hydrogeological) environment during construction to ensure that there will be no negative impact on the quantitative or qualitative or morphology of the nearby watercourses.

During operation, to mitigate potential contamination from surface water runoff, which may originate from roadways, car parks and hardstanding areas, a sustainable urban drainage system (SuDS) is incorporated into the design. This system is designed to minimise the risk of contaminants, such as hydrocarbons, entering the stormwater drainage network and subsequently impacting surface waterbodies like the Groody River, River Shannon (Lower), and Limerick Dock Transitional Waterbody, as well as groundwater bodies i.e. the Limerick City East GWB underlying the site.

The surface water drainage strategy integrates various SuDS measures, including green roofs, rain gardens, infiltration trenches, engineered swales, tree root systems and permeable paving. These features will effectively manage surface water flows, and direct the drainage to the attenuation pond. A flow control device will be installed downstream of the attenuation pond to ensure the surface water runoff is stored, prior to entering the network downstream i.e. the Shannon(Lower)_060 waterbody (including the Groody River and the River Shannon (Lower)).

River Shannon and River Fergus Estuaries SPA (Special Protected Areas Site Code: 004077) is located downstream of the site and WWTP. However, as mentioned above, the source pathway linkage is over a significant distance allowing for significant attenuation and large dilution factor within the river catchment and estuary. This Natura 2000 site was excluded from the assessment due to its distance from the subject

site, the potential loading of contaminant from the site and WWTP, and significant dilution factor through its pathway.

There are no proposed diversions of any drainage ditches or waterbodies as part of the Proposed Development.

Overall, the potential effects on the current status of the surface waterbodies are considered *no impact i.e. no change to the WFD status or elements in terms of the hydrological environment*.

6.2 Hydrogeological Environment

Dewatering of the perched water in the made ground will be required to facilitate construction. However, no long-term significant dewatering is expected during either the construction or operation phase. This perched water is not connected to the natural hydrogeological regime and as such this minor dewatering activity is unlikely to have an impact on groundwater quantity or quality.

There is no potential for change in groundwater levels as a result of local changes in the groundwater regime at the site due to the limited extent of the dewatering activities and the natural recharge capacity of the underlying "Locally Important Aquifer", which allows for the maintenance of groundwater levels. In addition, the mitigation measures that will be implemented during construction (as set out in the CEMP) and operational design measures (SuDS) will ensure there are no potential impacts on the hydrogeological environment.

Therefore, there is no potential for change in water quality or levels as a result of local changes in the groundwater regime at the site. There are no planned discharges to groundwater during the operational phase and no long-term groundwater dewatering for the project. The Proposed Development design includes increased hardcover across the site, some of which includes permeable paving.

During construction, there is limited potential of accidental discharges. However, should these occur they are temporary short-lived events that will not impact on the water status of the underlying bedrock aquifer long-term and as such will not impact on trends in water quality and over all status assessment. The project-specific Construction and Environmental Management Plan (CEMP) which is included with the planning application documentation, includes strict mitigation measures which will be implemented by the contractor to ensure the protection of the hydrological (and hydrogeological) environment during construction to ensure that there will be no negative impact on the quantitative or qualitative or morphology of the nearby watercourses.

In terms of the operational phase, the risk to the aquifer is considered to be low as bulk oil/fuel storage on site is not required as part of the Proposed Development and a drainage system incorporating the use of SuDS measures and interceptors on the stormwater drainage system prior to discharge from the site.

Overall, the potential effects on the WFD status to the groundwater bodies are considered no impact i.e., no change to the current status *or* elements in terms of the underlying hydrogeological environment.

6.3 Assessment in Terms of Future Good Status

The Shannon(Lower)_060 WFD surface waterbody (i.e. the local drainage network, the Groody River and the River Shannon (Lower); European Code: IE_SH_25S012600); has a most recent WFD surface water status (WFD Period: 2019-2024) of 'Moderate' and its current WFD risk score (3rd risk cycle) is 'under review'. This moderate status for the Shannon(Lower)_060 waterbody is based on modelling and is reported with 'low confidence'.

The Limerick Dock Transitional Waterbody located (c. 2.97 km linear distance from the site) of the Proposed Development Site has a 'Poor' status and a risk score of and 'At risk of not achieving good status'. As mentioned above, Limerick Dock failed to achieve good status due to poor fish and high phytoplankton status or potential, moderate hydromorphological conditions, high phosphorous and high oxygenation conditions.

The main pressures associated with the Shannon(Lower) Sub-catchment (Shannon[Lower]_SC_090) are hydromorphology and agriculture, based on the WFD Cycle 2 report produced by the EPA in December 2018 and the 3rd Cycle Lower Shannon and Mulkear Catchment Report (HA25D) (EPA, 2024).

Presently, the groundwater body in the region of the site (Limerick City East GWB - European Code: IE_SH_G_138) which the site is located entirely within, has a WFD status of 'Good' (WFD Period: 2019-2024) and a WFD risk score (3rd Cycle) of 'At Risk' of not achieving good status.

At present there are no local targeted measures within the catchments to maintain or achieve improvements to the status of the water bodies. However, the following are some pressures associated with waterbody catchments:

- Physical modifications
- Management of pollution from agricultural activities
- Management of pollution from sewage and wastewater
- Management of pollution from urban environments
- Changes to natural flow and levels of water
- Managing invasive non-native species

The Proposed Development will incorporate SuDS measures within the landscape and drainage design in order to manage run-off quality and foul drainage management will be in compliance with UÉ specifications. No dewatering is required during operation. All discharges will be adequately treated through the proposed SuDS measures as outlined in Section 4.2 above. As such there will be no change to the existing status as a result of the Proposed Development.

Based on the above information it is not considered that any aspects of the Proposed Development will prevent the WFD objectives from being achieved or to meet the requirements and/or objectives in the Water Action Plan 2024 - A River Basin Management Plan for Ireland, (Department of Housing Local Government & Heritage, Sept 2024).

7. CONCLUSIONS

Appendix A contains the background information and the WFD classification elements for surface water and groundwater body status. The colour coded system referred to in Appendix A – Table 1 and Table 2 are used to give a visual impression of the surface water and groundwater assessment, respectively

The WFD assessment indicates that, based on the current understanding of the Proposed Development, there is no potential for adverse or minor temporary/long-term or localised effects on the Groody River or River Shannon (Lower) (Shannon(Lower)_060; EU Code IE_SH_25S012600) or the Limerick Dock transitional waterbody (EU Code: IE_SH_060_0900).

Therefore, it has been assessed that the Proposed Development will not cause any significant deterioration or change in water body status or prevent attainment, or potential to achieve, future good status or to meet the requirements and/or objectives in the Water Action Plan 2024 - A River Basin Management Plan for Ireland, (Department of Housing Local Government & Heritage, Sept 2024).

The WFD assessment indicates that there is no potential for adverse or minor temporary or localised effects on the Limerick City East GWB (European Code: IE_SH_G_138). Therefore, it has been assessed that it is unlikely that the Proposed Development will cause any significant deterioration or change on its water body status or prevent attainment, or potential to achieve the WFD objectives or to meet the requirements and/or objectives in the Water Action Plan 2024 - A River Basin Management Plan for Ireland, (Department of Housing Local Government & Heritage, Sept 2024).

No further assessment of WFD is recommended given that no significant deterioration or change in water body status is expected based on the current understanding of the Proposed Development during construction and operation.

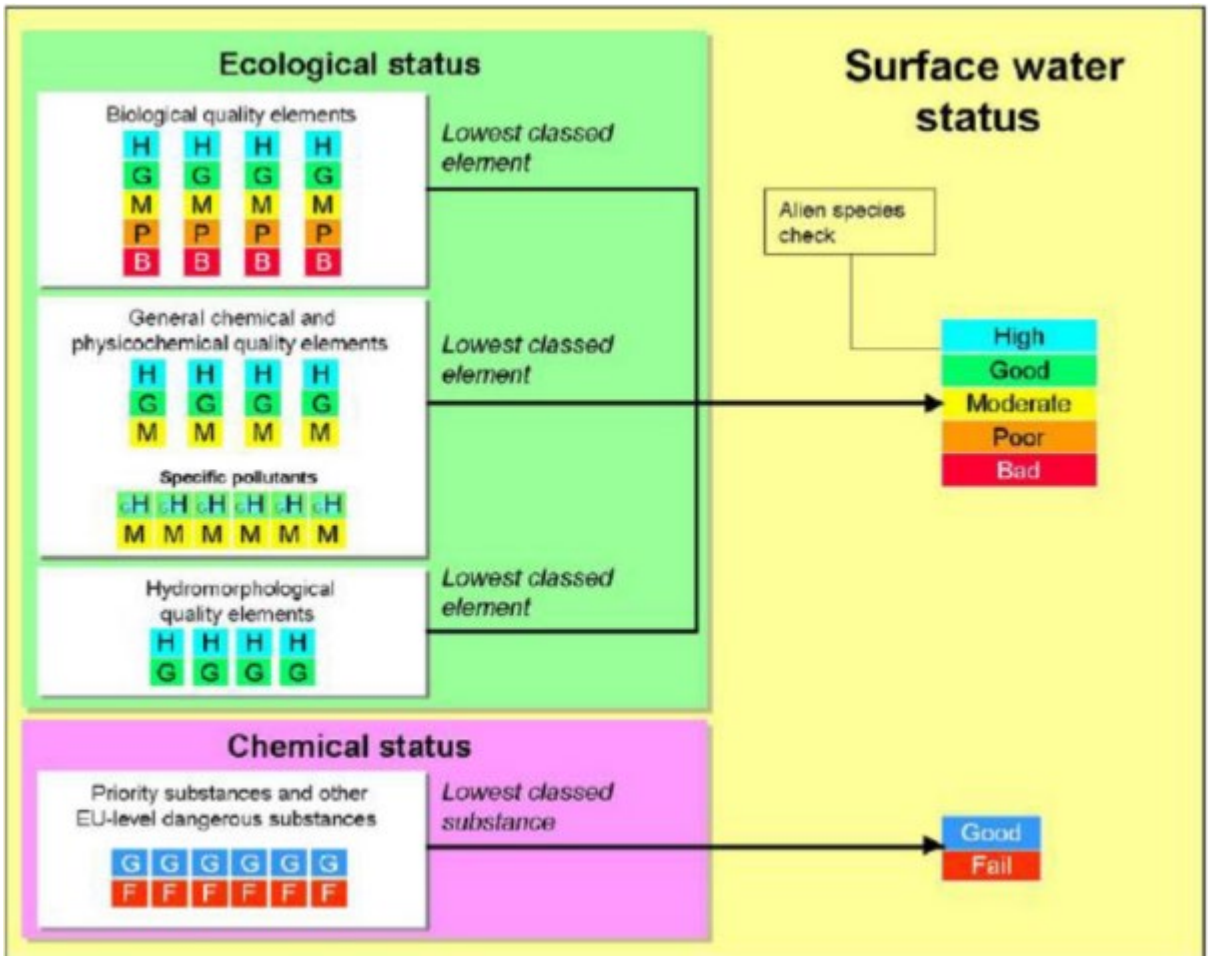
APPENDIX A. WFD ASSESSMENT MATRIX

WATER FRAMEWORK DIRECTIVE ASSESSMENT MATRIX

1.1 Background to Surface Water Body Status & Groundwater Body Status

Under the WFD, surface water body status is classified on the basis of chemical and ecological status or potential. Ecological status is assigned to surface water bodies that are natural and considered by the EPA not to have been significantly modified for anthropogenic purposes (i.e., culverting). Ecological potential is assigned to artificial and man-made water bodies (such as canals), or natural water bodies that have undergone significant modification. The term 'ecological potential' is used as it may be impossible to achieve good ecological status because of modification for a specific use, such as navigation or flood protection. The ecological potential represents the degree to which the quality of the water body approaches the maximum it could achieve. The worst-case classification is assigned as the overall surface water body status, in a 'one-out all-out' system (i.e., by taking the worst case of all the combined risk outcomes). This system is summarised below in Figure 1.

Figure 1: WFD classification elements for surface water body status (EPA, 2015)



1.1.2 Chemical Status

Chemical status is defined by compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC). This is assigned on a scale of good or fail. Surface water bodies are only monitored for priority substances where there are known discharges of these pollutants; otherwise, surface water bodies are reported as being at good chemical status.

1.1.3 Ecological Status

Ecological status or potential is defined by the overall health or condition of the watercourse. This is assigned on a scale of High, Good, Moderate, Poor or Bad, and on the basis of four classification elements or 'tests', as follows:

- **Biological:** This test is designed to assess the status indicated by a biological quality element such as the abundance of fish, invertebrates or algae and by the presence of invasive species. The biological quality elements can influence an overall water body status from Bad through to High.
- **Physico-chemical:** This test is designed to assess compliance with environmental standards for supporting physicochemical conditions, such as dissolved oxygen, phosphorus and ammonia. The physicochemical elements can only influence an overall water body status from Moderate through to High.
- **Specific pollutants:** This test is designed to assess compliance with environmental standards for concentrations of specific pollutants, such as zinc, cypermethrin or arsenic. As with the physico-chemical test, the specific pollutant assessment can only influence an overall water body status from Moderate through to High.
- **Hydromorphology:** For natural waterbodies, this test is undertaken when the biological and physicochemical tests indicate that a water body may be of High status. It specifically assesses elements such as water flow, sediment composition and movement, continuity, and structure of the habitat against reference or 'largely undisturbed' conditions. If the hydromorphological elements do not support High status, then the status of the water body is limited to Good overall status. For artificial or highly modified waterbodies, hydromorphological elements are assessed initially to determine which of the biological and physico-chemical elements should be used in the classification of ecological potential. In all cases, assessment of baseline hydromorphological conditions are an important factor in determining possible reasons for classifying biological and physicochemical elements of a water body as less than Good, and hence in determining what mitigation measures may be required to address these failing water bodies.

1.2 Background to Groundwater Body Status

Under the WFD, groundwater body status is classified on the basis of quantitative and chemical status. Status is assessed primarily using data collected from the EPA monitoring network; therefore, the scale of assessment means that groundwater status is mainly influenced by larger scale effects such as significant abstraction or widespread/diffuse pollution. The worst-case classification is assigned as the overall groundwater body status, in a 'one-out all-out' system. This system is summarised in Figure 2 below.

1.2.1 Quantitative Status

Quantitative status is defined by the quantity of groundwater available as baseflow to watercourses and water-dependent ecosystems, and as 'resource' available for use as drinking water and other consumptive purposes. This is assigned on a scale of Good or Poor, and on the basis of four classification elements or 'tests' as follows:

- **Saline or other intrusions:** This test is designed to identify groundwater bodies where the intrusion of poor-quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.
- **Surface water:** This test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the ecological status of associated surface water bodies.
- **Groundwater Dependent Terrestrial Ecosystems (GWDTEs):** This test is designed to identify groundwater bodies where groundwater abstraction is leading to "significant damage" to associated GWDTEs (with respect to water quantity).

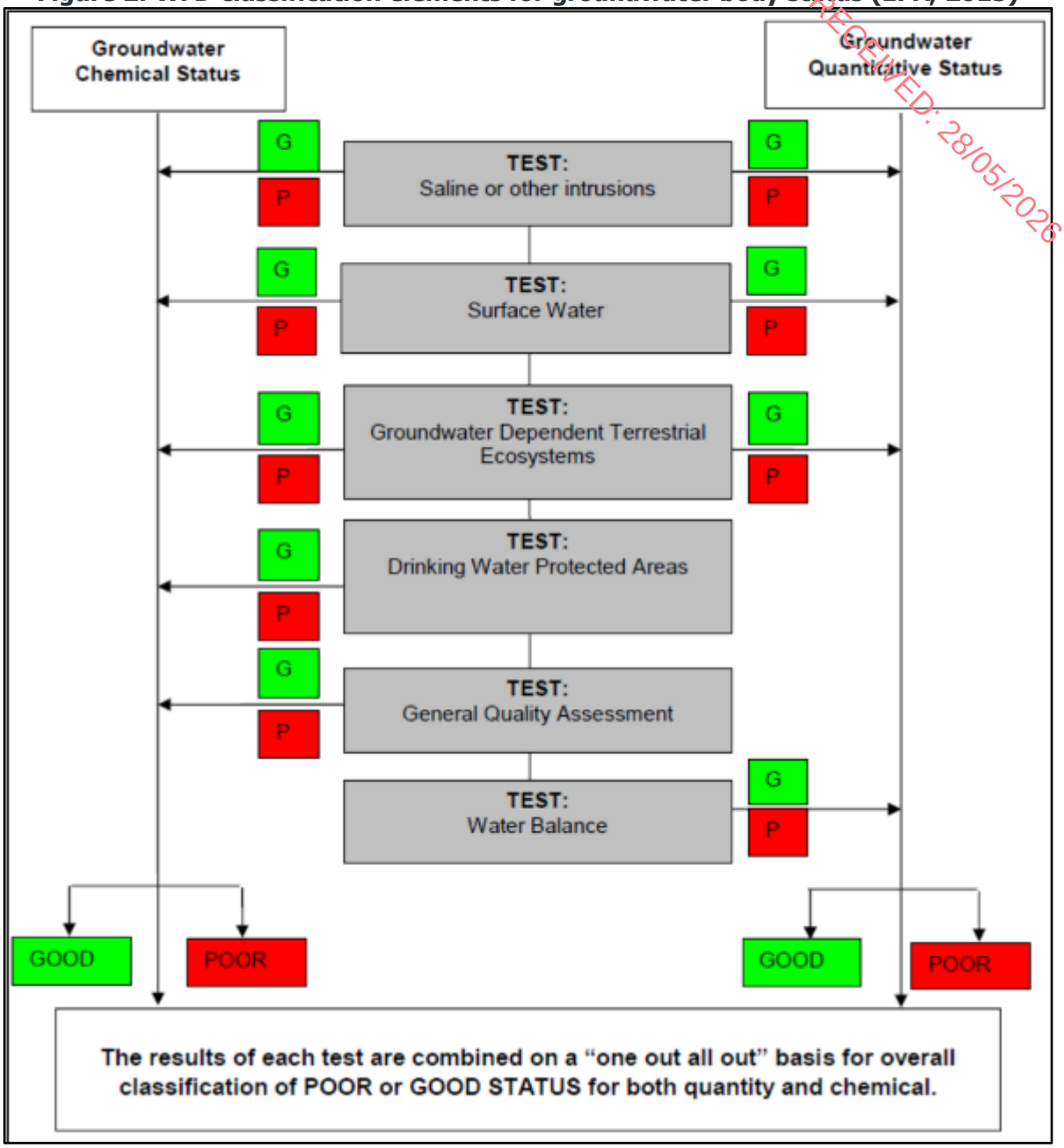
- **Water balance:** This test is designed to identify groundwater bodies where groundwater abstraction exceeds the "available groundwater resource", defined as the rate of overall recharge to the groundwater body itself, as well as the rate of flow required to meet the ecological needs of associated surface water bodies and GWDTEs.

1.2.2 Chemical Status

Chemical status is defined by the concentrations of a range of key pollutants, by the quality of groundwater feeding into watercourses and water-dependent ecosystems and by the quality of groundwater available for drinking water purposes. This is assigned on a scale of Good or Poor, and on the basis of five classification elements or 'tests' as follows:

- **Saline or other intrusions:** This test is designed to identify groundwater bodies where the intrusion of poor-quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.
- **Surface water:** This test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the chemical status of associated surface water bodies.
- **GWDTEs:** This test is designed to identify groundwater bodies where groundwater abstraction is leading to "significant damage" to associated GWDTE's (with respect to water quality).
- **Drinking Water Protected Areas (DrWPAs):** This test is designed to identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future.
- **General quality assessment:** This test is designed to identify groundwater bodies where widespread deterioration in quality has or will compromise the strategic use of groundwater.

Figure 2: WFD classification elements for groundwater body status (EPA, 2015)



APPENDIX B. NON-DETERIORATION ASSESSMENT

Risk screening of potential to cause deterioration of current WFD status

	Surface Water	Scheme Elements	**Data Centre Development**						Mitigation Measures	Overall Impact with mitgation measures
	Shannon(Lower)_060 (IE_SH_25S012600)	Phase (Construction/ Operation)	Construction	Construction	Construction	Construction	Operation	Operation		
		Identified Quantitative Impacts	Increased run-off and sediment loading	Temporary land-take during the construction phase	Pollution due to accidental discharges or spillages during the construction phase	Scour during the construction phase	Increase in Hardstanding	Storage of Fuel		
WFD Status	Macrophytes and phytobenthos - combined	Predicted change to status elements (green = none, amber = possibly, red = likely)	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	**Construction**: The project-specific CEMP will include robust mitigation measures to protect the underlying hydrogeological environment. The CEMP will be a live document, and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent conditions relevant to the proposed development. These include management of soils, re-fuelling machinery and chemical handling and control of water during the construction phase. No long-term significant dewatering is required which could impact on quantitative status. **Operation**: The proposed development will not require bulk storage of oils or fuels. There will be numerous Sustainable Drainage Systems (SuDS) devices implemented, such as attenuation, interception and flow control devices. No significant abstraction is required during the operation phase.	No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Macroinvertebrates		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Fish		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
Physio-Chemical Status	Oxygenation	Predicted change to status elements (green = none, amber = possibly, red = likely)	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Acidification		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Total Ammonia		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Total Nitrogen		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Ortho-Phosphate		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
Hydromorphological Elements	Quantity and dynamics of river flow	Predicted change to status elements (green = none, amber = possibly, red = likely)	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Connection to Groundwater		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	River continuity		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	River depth and width variation bed		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Structure and substrate of river bed		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Structure of riparian zone		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status

Risk screening of potential to cause deterioration of current WFD status

	Groundwater	Scheme Elements	**Data Centre Development**				Mitigation Measures	Overall Impact
	IE_SH_G_138	Phase (Construction/ Operation)	Construction	Construction	Operation	Operation		
	Limerick City East Groundwater Body	Identified Quantitative Impacts	Increased run-off and sediment loading	Pollution due to accidential discharges or spillages during the construction phase	Increase in Hardstanding	Storage of Fuel		
Quantitative Elements	**Saline or other intrusions.** To identify groundwater bodies where the intrusion of poor quality water as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.	Predicted change to status elements (green = none, amber = possibly, red = likely)	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	**Construction**: The project-specific CEMP will include robust mitigation measures to protect the underlying hydrogeological environment. The CEMP will be a live document, and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent conditions relevant to the proposed development. These include management of soils, re-fuelling machinery and chemical handling and control of water during the construction phase. No long-term significant dewatering is required which could impact on quantitative status. **Operation**: The proposed development will not require bulk storage of oils or fuels. There will be numerous Sustainable Drainage Systems (SuDS) devices implemented, such as attenuation, interception and flow control devices. No significant abstraction is required during the operation phase.	No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Surface water. To assess the impact of groundwater abstractions on the ecological status of surface water bodies.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Groundwater Dependent Terrestrial Ecosystems (GWDTE's) To assess the impact of groundwater abstractions on the condition of GWDTE'S.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Water balance To identify groundwater bodies where abstractions exceed the available resource.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
Chemical Elements	**Saline or other intrusions.** To identify groundwater bodies where the intrusion of poor quality water as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.	Predicted change to status elements (green = none, amber = possibly, red = likely)	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Surface water. To assess the impact of groundwater abstractions on the ecological status of surface water bodies.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Groundwater Dependent Terrestrial Ecosystems (GWDTE's) To assess the impact of nutrient concentrations in groundwater (primarily phosphates) on GWDTE's.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	Drinking Water Protected Areas (DrWPAs) To identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status
	General quality assessment To identify groundwater bodies where widespread deterioration in quality has or will compromise the strategic use of groundwater.		No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.	No measurable change anticipated.		No anticipated impacts to the hydrological environment with no deterioration to the WFD Status

APPENDIX 6.4

Hydrology and Hydrogeology Risk Assessment

AWN Consulting

REPORT

Hydrological and Hydrogeological Qualitative Risk Assessment

Parkway Valley LRD at Dublin Road, Limerick

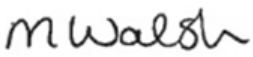
CLIENT	DOCUMENT REFERENCE	DATE
Kirkland Investments	257501.0277WR01	20 May 2026

AWN Consulting Ltd, The Tecpro Building, IDA Business & Technology Park, Clonshaugh, Dublin 17, D17 XD90

DOCUMENT CONTROL SHEET

Document Control Sheet	
Our Reference	257501.0277WR01
Original Issue Date	20 May 2026
Client:	Kirkland Investments
Client Address:	3rd Floor, Carlton House, Henry Street, Limerick, Co. Limerick, V94 FD80

Revision	Revision Date	Description

Details	Written by	Approved by
Signature		
Name	Megan Walsh	Marcelo Allende
Title	Environmental Consultant	Principal Hydrological Consultant
Date	20 May 2026	

Disclaimer
This report considers the specific instructions and requirements of our client. It is not intended for third-party use or reliance, and no responsibility is accepted for any third party. The provisions in this report apply solely to this project and should not be assumed applicable to other developments without review and modification.

ENVIRONMENT I.S. EN ISO 14001:2015 NSAI Certified
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1. INTRODUCTION

AWN Consulting (AWN), a Trinity Consultants Company, have been requested by Kirkland Investments to carry out a Hydrological and Hydrogeological Qualitative Risk Assessment (HRA) for the proposed Parkway Valley LRD which is located on the Dublin Road (R445) in Limerick. The purpose of this HRA is to assess the potential for any likely significant impacts on receiving waters and protected areas during construction or post development once operational, in the absence of taking into account any measures intended to avoid or reduce harmful effects of the proposed project (i.e. standard control measures).

1.1 Objective of the Report

The scope of this desktop review is to assess the likely significant construction and operation impacts from the Proposed Development on receiving water quality and overall water body status within the Lower Shannon Catchment (where relevant European Sites are located) in the absence of mitigation measures. The assessment relies on information regarding construction and design provided by:

- Various design site plans and drawings, as submitted with the planning documentation for this application.
- Stage 2 Flood Risk Assessment, Punch Consulting Engineers, May 2026 (included as Appendix 6.2 to Chapter 6 of the EIAR)
- Planning Engineering Report, Punch Consulting Engineers, May 2026.
- Construction Environmental Management Plan (CEMP), Punch Consulting Engineers, May 2026.
- Parkway Valley Phase 1, Dublin Road, Singland, Limerick – Site Investigation, Report no. OCB25-049 (OCB Geotechnical, October 2025).
- Consultation with design architects and engineers.

This report was prepared by Megan Walsh and Marcelo Allende.

Megan Walsh (BSc)Hons is an Environmental Consultant with experience in Environmental Impact Assessment Reporting (EIAR), Hydrological & Hydrogeological Risk Assessment, Soil Quality Assessments, surface and groundwater monitoring and geotechnical site investigations. Megan holds a B.Sc. Hons in Environmental Science from University College Cork. She is currently a member of the International Association of Hydrogeologists (IAH, Irish Group).

Marcelo Allende (BSc, BEng) is a Principal Environmental Consultant (Hydrologist) with AWN Consulting with over 20 years of experience in water resources technical studies, conceptual and numerical hydrological/hydrogeological modelling and environmental consultancy. Marcelo holds a degree in Water Resource Civil Engineering (BEng, Hons) from the University of Chile and a Bachelor of Science in Engineering (BSc, Hons). He has worked on a wide range of projects including multi-aspect environmental investigations, geo-environmental impact assessments, surface and groundwater resource management, hydrological and hydrogeological conceptual and numerical modelling, strategic and site specific flood risk assessments (Stage 1, 2 and 3), Due Diligence reporting, baselines studies, soils, surface water and groundwater monitoring and field sampling programmes on a variety of brownfield and greenfield sites throughout Ireland as well as overseas in Chile, Argentina, Peru and Panama. He also has detailed knowledge of environmental guidance, legislation, regulations & standards and expertise in GIS (expert level) and MATTE studies at COMAH establishments. He is currently a member of the International Association of Hydrogeologists (IAH, Irish Group) and a member of Engineers Ireland (MIEI).

1.2 Background and Site Description

The site is approximately 6.18 ha and is located in the Singland area immediately to the east of the roundabout entrance to Parkway Retail Park off the Dublin Road (R445). The site is located adjacent to the Dublin Road approximately 2.5km east of Limerick City centre. There are existing semi-detached two

storey houses and a retail park to the west, semi-detached two storey houses to the south, agricultural lands to the east, and agricultural lands, an apartment block, commercial units and an ESB substation to the north separated from the site by the Dublin Road (R445). It is proposed to develop the site to provide 403 no. residential units over 5 no. apartment blocks, a crèche and medical centre. Refer to Figure 1-1 below for the site location map and Figure 1-2 for the proposed site layout.

Figure 1-1: Site Location Map (Google Satellite, 2026)

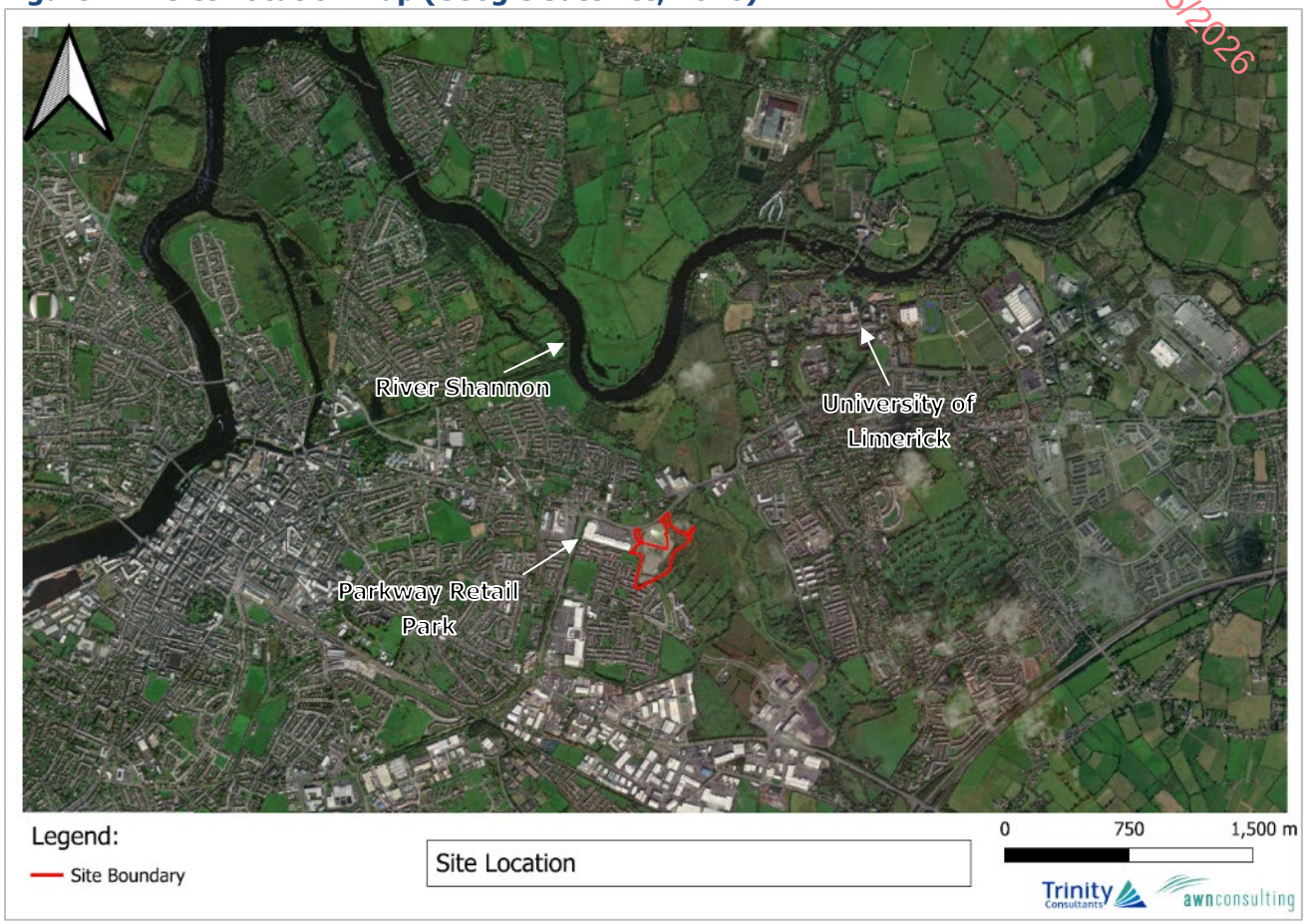
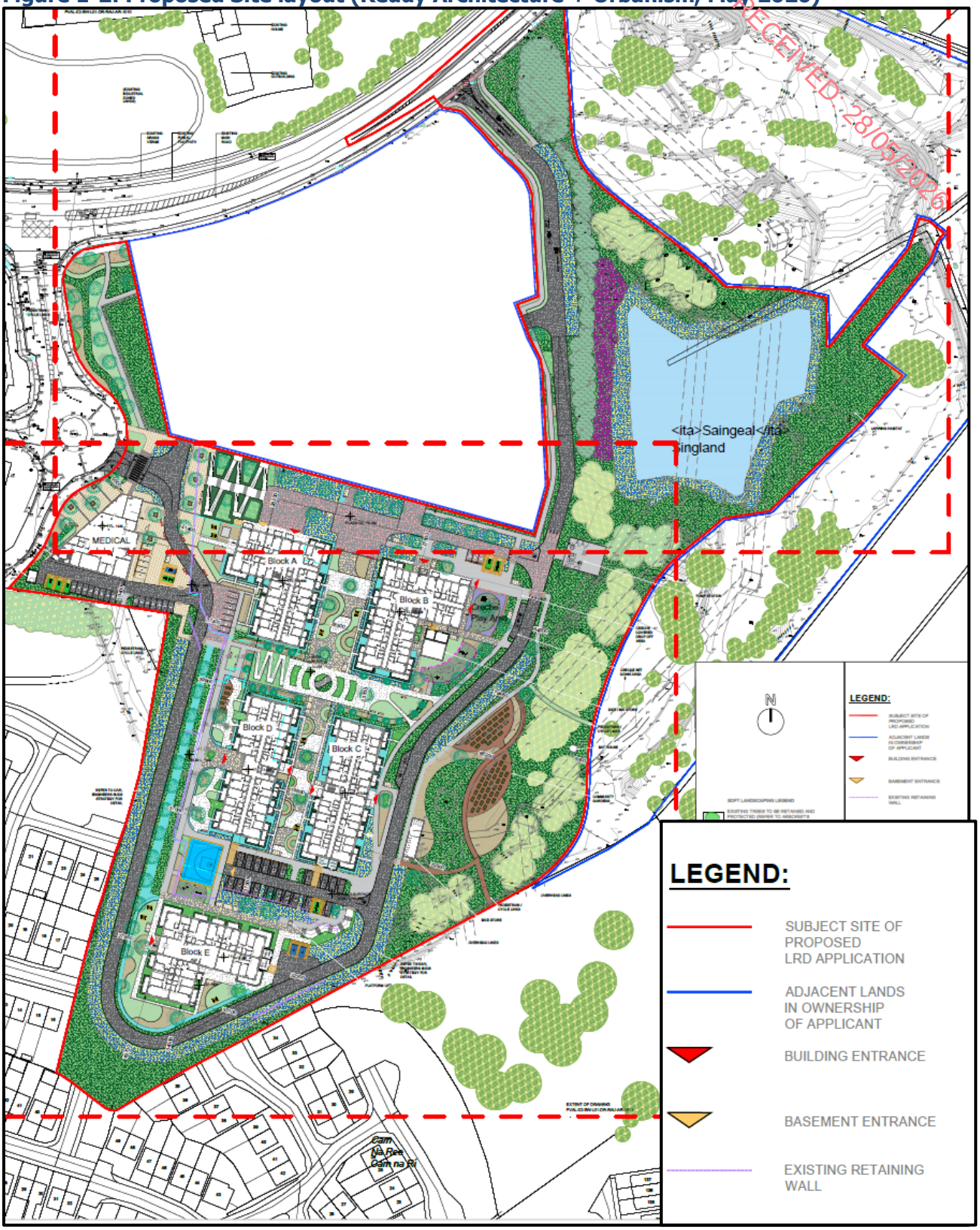


Figure 1-2: Proposed Site layout (Reddy Architecture + Urbanism, May 2026)



A review of early historical mapping records dated from 1829 to the early 20th century coupled with historical aerial imagery dated from 1995 to the present day indicated that the subject site was unoccupied by any building structures until 2007. A shopping centre was partially constructed in 2007 and was demolished in 2020, with reinforced concrete retaining walls left in situ. It is understood that much of the

material from the demolition was used for backfilling and land raising purposes on the site such that the site is now predominately covered in made ground.

The subject site consists of a gravel footprint, buried concrete where the previous development was demolished in the centre, and some brownfield areas towards the southern and eastern boundaries which were likely reworked during the construction/demolition phase of the previous project. The reinforced concrete retaining walls are to be incorporated as part of the Proposed Development. The ground level of the site is elevated above the Groody River floodplain to the east. The current site sits at elevations between 5 m and 17 m above ordnance datum (AOD) Malin, with majority of the site generally flat (between 8.4 m and 9.64 mAOD) and falling to the east.

The site is characterised as artificial surface (urban fabric, Corine Land Cover Classification Code_18: 112) with heavily vegetated areas in the eastern and southeastern portion of the site (pastures, Corine Land Cover Classification Code_18: 231).

1.3 Hydrological Setting

There is no existing artificial surface water drainage network within the proposed site. There is some low-level ponding evident in aerial photographs of the site which is due to the concrete beneath the surface limiting run-off and infiltration. However, there were no bodies of standing water or habitats which could be described as wetlands identified on site. Run-off from the area is drained via infiltration to ground in surrounding areas under the influence of gravity.

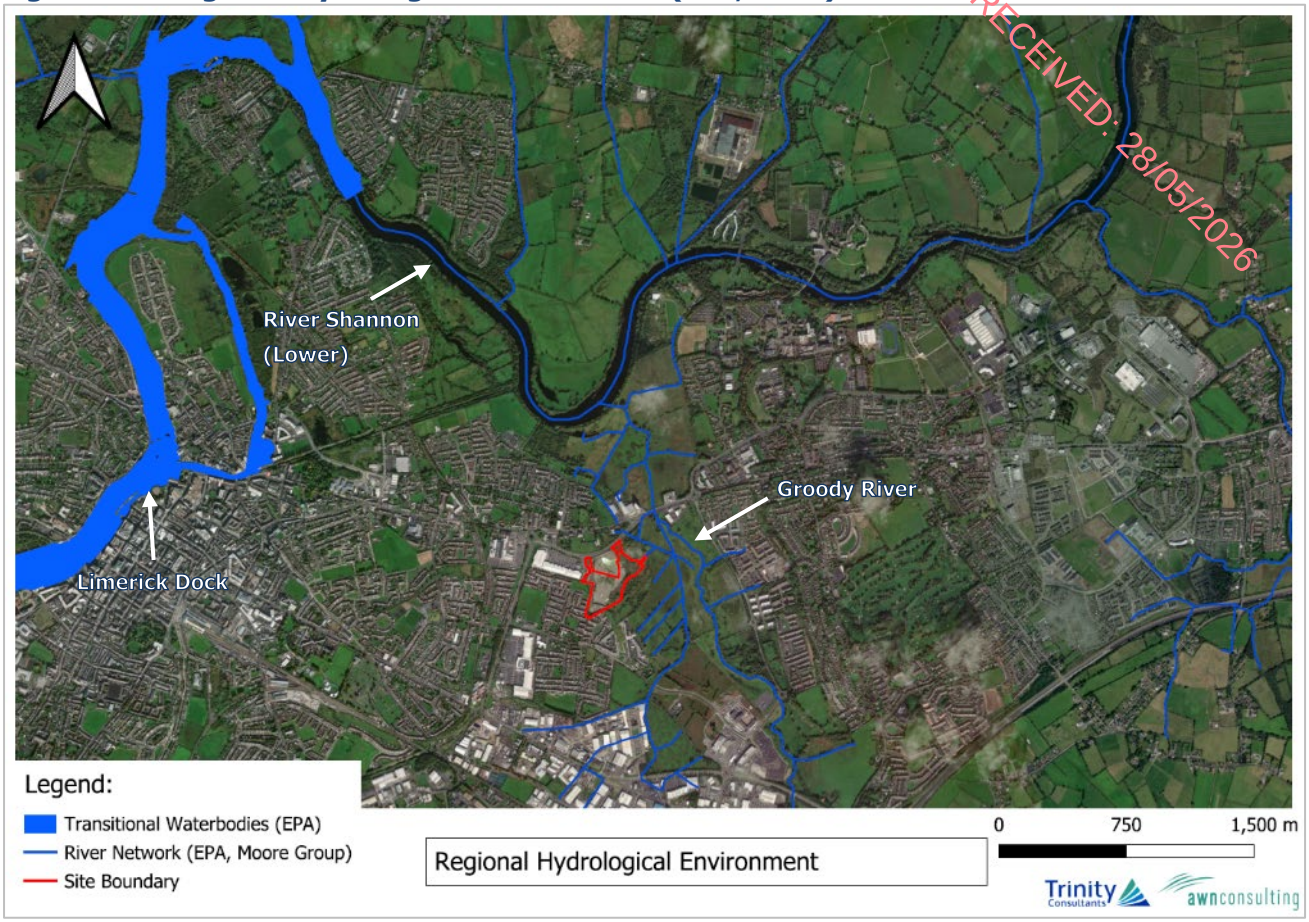
The Environmental Protection Agency (EPA) provides online mapping resources, which show two (2) no. unnamed surface watercourses within the Proposed Development site boundary flowing in an easterly direction towards an OPW arterial drainage channel c. 160 m to the east referred to by the EPA as 'Industrial Estate Galvone' watercourse. However, based on the site walkovers and surveys undertaken, these are no longer evident on the site. There is an open drain at the eastern site boundary connected to Industrial Estate Galvone stream which ultimately discharges to the Groody River. As stated in the Engineering Planning Report, prepared by Punch Consulting Engineers, no upstream catchments are believed to connect to these drains as all upstream sites have been developed with their own surface water networks which discharge into the main drainage. Figure 1-3 and Figure 1-4 below show the local and regional hydrological environment, respectively.

As mentioned above, the Groody River is the closest surface waterbody to the site. The Groody River rises approx. 10 km south of the site in Cahercornlish, Co. Limerick and is located circa 200 m to the east of the eastern most boundary of the Proposed Development site. Numerous streams merge into the Groody River as it flows from south to north through the Groody Valley, draining a number of Industrial Estates along the way, for approximately 1.1 km (hydrological distance) before discharging to the River Shannon (Lower).

The River Shannon (EU Code IE_SH_25S012600) is the main hydrological feature of the region and runs in an east-west direction in the region of the study area and is located approximately 705 m to the north of the site at the point of closest proximity. The River Shannon joins the Limerick Dock WFD Transitional Waterbody (EPA Code: IE_SH_060_0900) approx. 2.97 km downstream of the subject site. The watercourse then merges with the Upper, followed by the Lower Shannon Estuary WFD Transitional Waterbody (EPA Code: IE_SH_060_0800 and IE_SH_060_0300), prior to ultimately discharging into the Atlantic Ocean via the Lower Shannon Estuary (EPA Code: IE_SH_060_0300) on the west coast of Ireland via the Mouth of the Shannon between Loop Head and Kerry Head.

Figure 1-3: Local Hydrological Environment (Moore Group, 2026)

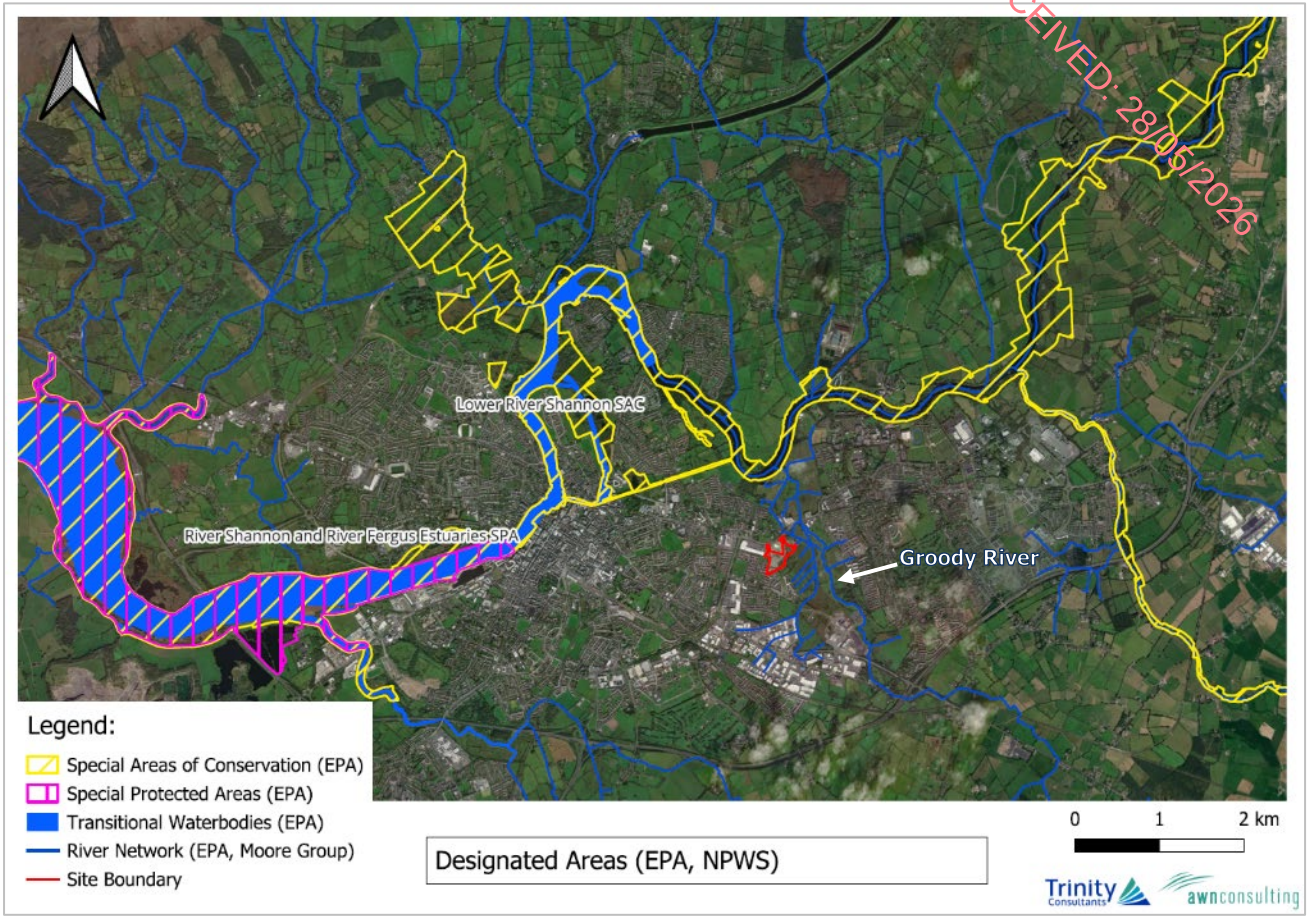
Figure 1-4: Regional Hydrological Environment (EPA, 2026)



It should be noted that the Groody River is hydrologically connected to the River Shannon SAC (Special Area of Conservation). The River Shannon SAC is located c. 705 m north of the site (linear distance) and c. 1.4 km downstream (hydrological distance). The River Shannon and River Fergus Estuaries SPA (Site Code: 004077) is located within the Limerick Dock transitional waterbody (European Code: IE_SH_060_0900) and is c. 2.97 km downstream of the site based on linear distance and c. 4.6 km downstream based on hydrological distance. Refer to Figure 1-5 below.

The site is indirectly hydrologically connected to the Groody River. Therefore, it is expected that the Proposed Development would have an indirect hydrological connection to the above SAC and SPA through the surface water drainage from site. Although the source pathway linkage is over a significant distance allowing for attenuation and large dilution factor within the river catchment and estuary. There will also be a hydrological connection the SAC and SPA sites through the wastewater effluent from the wastewater treatment plant (WWTP). However, Limerick WWTP has sufficient available capacity (based on the AER for 2024) and it operates under an EPA licence with defined emission limit values and compliance conditions to ensure that treated effluent discharges do not compromise the achievement of WFD environmental objectives in the receiving waterbody.

Figure 1-5: Natura 2000 Conservation & Protection Areas and Hydrological Environment (NPWS and EPA, 2026)



1.4 Description of Existing and Proposed Drainage

1.4.1 Existing and Proposed Surface Water Drainage

1.4.1.1 Existing Surface Water Drainage

There is no existing surface water drainage network running within the site boundary of the Proposed Development according to record drawings by Limerick City and County Council (LCCC). As mentioned above, there are no surface watercourses present within the site boundary. No bodies of standing water or habitats which could be described as wetlands exist onsite.

There is an existing Uisce Éireann foul water drainage in the Parkway Retail Park which ultimately discharges into a combined sewer on Childers Road.

1.4.1.2 Proposed Surface Water Drainage

A new fully separated surface water sewer network is proposed for the development. In accordance with the Limerick Development Plan 2022–2028 and the Greater Dublin Strategic Drainage Study (GDSDS), surface water discharge will be restricted to the greater of 2 l/s/ha or Qbar. The system is designed to manage the 1% AEP (1:100-year) storm event, including a 30% allowance for climate change.

Discharge from the site will be controlled via a hydrobrake located upstream of the stormwater outfall, which will convey flows by gravity to the Industrial Estate Galvone, which discharges to the Groody River.

The drainage system has been designed using Causeway Flow software, in line with *Recommendations for Site Development Works for Housing Areas* (DoEHLG), the GDSDS, CIRIA guidance (C644 and C753), and Limerick City & County Council requirements. Modelling applied an M5-60 of 16.5 mm, a ratio (R) of 0.307, a 30% climate change uplift, and 10% additional area for urban creep. All finished floor levels are at least 500 mm above the 1:100-year drainage water level.

The design prioritises Sustainable Drainage Systems (SuDS) to minimise impact on the receiving environment. SuDS features include green roofs, bioretention areas (rain gardens), permeable paving, porous asphalt, swales, infiltration trenches, tree-pit attenuation and attenuation pond. These measures promote infiltration, evapotranspiration, pollutant removal, and runoff reduction ensuring that, during typical low-intensity storms, most rainfall is retained within SuDS features rather than entering the public network.

- **Green Roofs:** Extensive sedum green roofs will be provided across large areas of the proposed buildings. These offer visual and ecological benefits, reduce runoff, and are widely recognised as an effective SuDS measure.
- **Permeable Paving and Porous Asphalt:** Courtyards and limited surface parking areas will use permeable paving, while internal roads will use porous asphalt. These provide filtration, biodegradation, adsorption of pollutants, and settlement of solids, avoiding the need for traditional oil interceptors.
- **Rain Gardens (Bioretention Areas):** Rain gardens will treat runoff from low-intensity storms through filtration and evapotranspiration within high-permeability soil (900 mm depth), supported by perforated sub-drains that overflow to the main stormwater network when required. Their extent and layout follow landscape architectural design.
- **Infiltration Trenches and Swales:** These features provide additional attenuation through void storage within lined stone trenches, with high-level overflows to the drainage network. Swales incorporate interception storage and can achieve zero runoff for the first 5 mm of rainfall in line with CIRIA C753 guidance.
- **Tree-Root SuDS Systems:** Where feasible, hard-landscaped areas will drain to tree pits designed with drainage stone/subsoil to provide interception and attenuation. These systems also follow CIRIA C753 guidance for bioretention performance.
- **Attenuation Pond:** A landscaped open attenuation pond will provide the primary storage for the 1-in-100-year event, with 0.5 m freeboard. It is designed to integrate naturally within the site's landscape and further reduce peak runoff.

Refer to the Engineering Report, prepared by Punch Consulting Engineers (May 2026) submitted as part of the planning application for further information on the proposed surface water management and design.

1.4.2 Flood Risk

The EU Floods Directive (2007/60/EC) required Member States to undertake a national preliminary flood risk assessment by 2011 to identify areas where significant flood risk exists or might be considered likely to occur. Members States were also required to prepare catchment-based Flood Risk Management Plans by 2018 that will set out flood risk management objectives, actions and measures. The Office of Public Works (OPW) in co-operation with various Local Authorities produced Preliminary Flood Risk Assessments (PFRAs) which aimed to map out current and possible future flood risk areas and develop risk assessment plans. As part of the National Catchment-based Flood Risk Assessment Management (CFRAM) programme, provisional flood maps had been produced by the OPW which have been used in this assessment.

PUNCH Consulting Engineers were commissioned by Kirkland Investments to carry out a Site-Specific Flood Risk Assessment (FRA) for the Proposed Development which is included as Appendix 6.2 of the EIAR. This Site-Specific FRA has been carried out in accordance with "The Planning System & Flood Risk Management Guidelines" published by the Department of the Environment, Heritage and Local Government in November 2009 and the Limerick Development Plan 2022-2028.

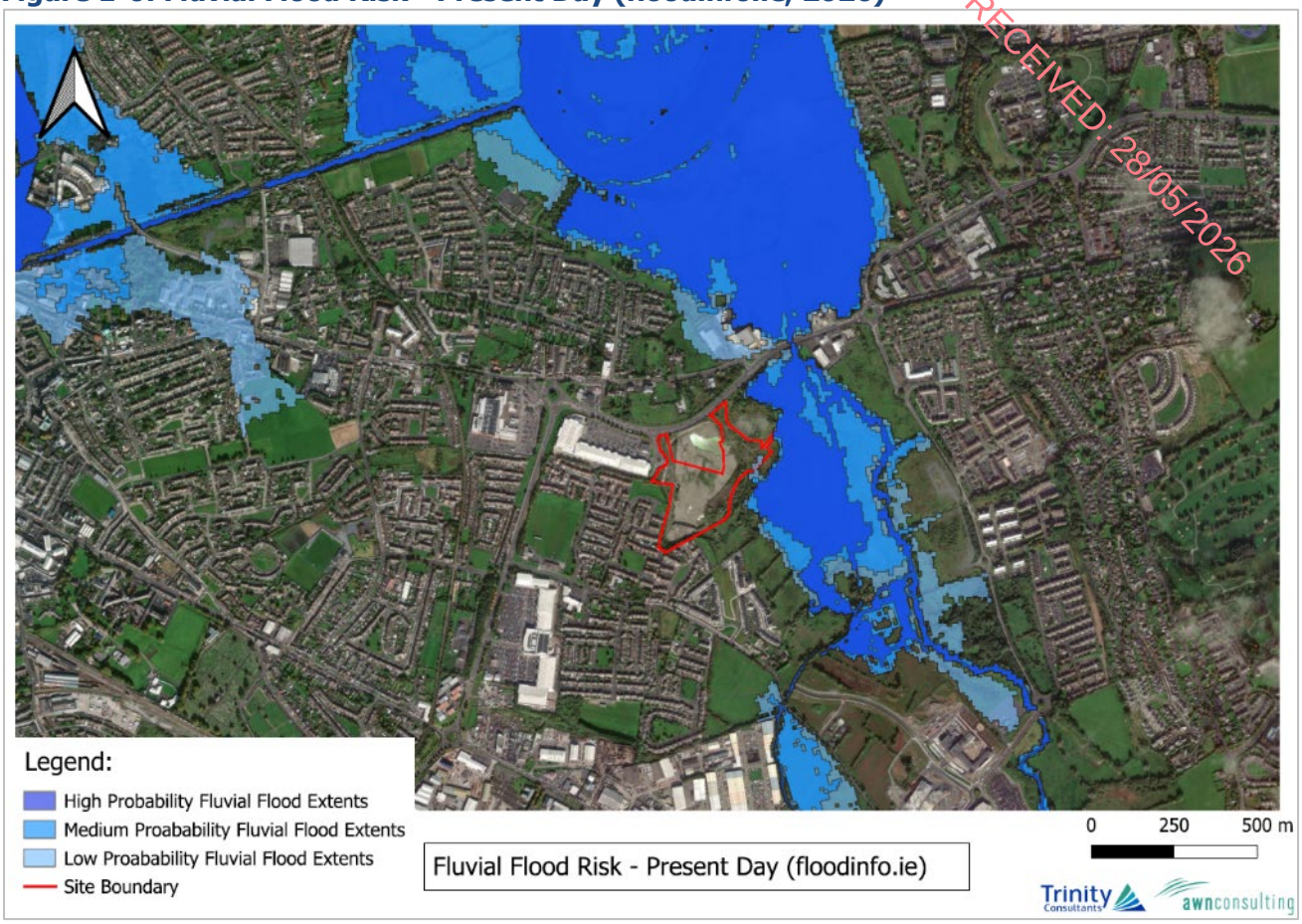
The following conclusions have been made on completion of the Stage 2 Site-Specific FRA:

- Flood Maps and the Limerick Development Plan Strategic FRA were consulted to establish the Flood Zone as the site is located near the Groody River. It was determined that the site is primarily located in Flood Zone C. The surface water outfall pipe which discharges into the Groody River will be located within Flood Zone A with all other proposed works located in Flood Zone C for fluvial flooding. Flood Zone C indicates the probability of a 1-in-1000-year event or an event of less severity occurring (0.1% annual exceedance probability or AEP). Flood Zone A indicates the probability of a 1-in-100-year event or one of greater severity occurring (1% AEP).
- The Proposed Development is at a low risk of flooding and is deemed appropriate provided the residual risk of fluvial flooding is addressed by the following flood mitigation measures at a minimum:
  - The proposed lowest finished floor level for the Proposed Development is 13.30mAOD in accordance with best practice and 7.27m above the CFRAMS 1% AEP for the Mid-Range Flood Scenario fluvial water level.
  - PUNCH Consulting Engineers recommend that as part of the site maintenance plan, all future proprietors inspect all road gullies in the vicinity and report any blockages to the Local Authority and/or Irish Water. The proprietor should also inspect all surface water drainage within the site, in particular following heavy rain which may cause debris to obstruct the channel (ACO) drain and road gullies.
  - The Proposed Development will provide stormwater drainage in accordance with the Local Authority Development Plan to alleviate pluvial flooding risk.

When examined using the sequential approach proposed in the "The Planning System & Flood Risk Management" Guidelines, the Proposed Development is appropriate.

The fluvial flood risk map is presented below in Figure 1-6. Coastal flooding was not found to impact the Groody River in close proximity to the site and therefore will not have an impact on the Proposed Development. Refer to PUNCH Consulting Engineers' FRA in Appendix 6.2 of the EIAR for more detailed information.

Figure 1-6: Fluvial Flood Risk - Present Day (floodinfo.ie, 2026)



1.4.3 Existing and Proposed Wastewater Drainage

1.4.3.1 *Existing Wastewater Drainage*

The site has no existing foul loading or foul water drainage system within the site boundary as it is currently not in use.

1.4.3.2 Proposed Wastewater Drainage

The foul water network for the Proposed Development has been designed using Causeway Flow software, in accordance with the DOEHLG Recommendations for Site Development Works for Housing Areas and the Uisce Éireann Code of Practice for Wastewater Infrastructure. The foul water system is fully separated from the proposed surface water network.

A new internal foul sewer network will collect flows and convey them to a proposed pumping station located within the eastern boundary of the site. The pumping station and rising main have been designed in accordance with Uisce Éireann requirements. It is proposed that the foul sewer will discharge by gravity to the proposed pumping station. The rising main will discharge into the existing drainage in the Parkway Retail Park which ultimately discharges into a combined sewer on Childers Road with the final connection point to be agreed with Uisce Éireann.

A Pre-Connection Enquiry (PCE) was submitted to Uisce Éireann on 9th June 2025, and a Confirmation of Feasibility (COF) was received from Uisce Éireann on 30th October 2025 which confirms the feasibility of the proposed water supply and wastewater connections (COF Ref. DS25006639), with infrastructure upgrades required to facilitate the watermain connection, to be funded by the Applicant.

The foul water design is based on the following parameters extracted from the Engineering Report prepared by Punch Consulting Engineers (May 2026):

- Occupancy rate: 2.7 persons per dwelling
- Residential flow rate: 150 L/person/day
- Medical facility flow rate: 450 L/person/day
- Crèche flow rate: 100 L/person/day
- Average demand: 1.25 DWF
- Peaking factor: 6 DWF (Residential) and 4.5 DWF (Creche and Medical Centre)
- Minimum self-cleansing velocity: 0.75 m/s
- Minimum pipe diameter: 150 mm

These parameters inform the hydraulic design to ensure adequate capacity, self-cleansing conditions, and compliance with national wastewater infrastructure standards.

The foul sewer for the Proposed Development eventually discharges to Limerick WWTP (D0013) for full treatment. According to the 2024 Annual Environmental Report (AER), the WWTP currently has adequate operational capacity to accommodate the additional flows generated by the Proposed Development. Following treatment, the final effluent from Limerick WWTP is discharged into Limerick Dock transitional waterbody.

Refer to the Engineering Report, prepared by Punch Consulting Engineers (May 2026) submitted as part of the planning application for further information on the proposed foul water management and design.

2. DESCRIPTION OF BASELINE ENVIRONMENT

A reliable Conceptual Site Model (CSM) requires an understanding of the existing hydrological and hydrogeological setting. This is described below for the Proposed Development site and surrounding hydrological and hydrogeological environs.

2.1 Hydrological Catchment Description

2.1.1 Regional and Local Hydrological Environment

The Proposed Development site is located within the Shannon (International) River Basin District (Shannon IRBD), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD). According to the EPA maps, the Proposed Development site as defined by the EPA nomenclature (EPA, 2026) is situated in Hydrometric Area No. 25 of the Irish River Network and is located within the Lower Shannon Catchment (Catchment ID: 25D) and the Shannon[Lower]_SC_090 Sub-Catchment (ID: 25D_9). The Lower Shannon Catchment encompasses an area of approximately 1041.27 km^2.

A review of EPA mapping shows two (2) no. unnamed surface watercourses within the Proposed Development site boundary flowing in an easterly direction towards an OPW arterial drainage channel c. 160 m to the east referred to by the EPA as 'Industrial Estate Galvone' watercourse. However, based on the site walkovers and surveys undertaken, these are no longer evident on the site. As stated in the Engineering Planning Report prepared by Punch Consulting Engineers (May 2026), no upstream catchments are believed to connect to these drains as all upstream sites have been developed with their own surface water networks which discharge into the main drainage network. There is an open drain at the eastern site boundary connected to Industrial Estate Galvone stream which ultimately discharges to the Groody River. The Groody River (EPA Code: IE_SH_25S012600), a tributary of the Shannon (Lower), is located c. 200 m to the east of the site and flows in a northerly direction.

The Groody River (WFD Name: Shannon(Lower)_060) rises approx. 10 km south of the Proposed Development in Cahercornlish, Co. Limerick. Numerous streams merge into the Groody River as it flows from south to north through the Groody Valley, draining a number of Industrial Estates along the way, for approximately 1.1 km (hydrological distance) before discharging to the River Shannon (Lower) c. 705 m north-east of the site. The River Shannon (Lower) and the Groody River comprise the WFD Shannon(Lower)_060 surface waterbody.

The River Shannon rises from the Shannon Pot which drains the Cuilcagh mountains in Co. Cavan (source) from which it flows predominantly due south/southwest for approximately 260 km downstream to Limerick Dock Transitional Waterbody (EPA Code: IE_SH_060_0900) c. 2.97 km downstream of the subject development site (hydrological distance), flowing into the Upper Shannon Estuary (EPA Code: IE_SH_060_0800), prior to ultimately discharging into the Atlantic Ocean through the Lower Shannon Estuary (EPA Code: IE_SH_060_0300) on the west coast of Ireland via the Mouth of the Shannon between Loop Head and Kerry Head.

The local and regional hydrological environment are shown in Figure 1-3 and Figure 1-4 above, repsectively.

2.1.2 Surface Water Quality

2.1.2.1 EPA Biological Q-Value Rating

Surface water quality is monitored periodically by the EPA at various regional locations along with principal and other smaller watercourses. The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of

such waters and reflects the overall trend in conditions of the watercourse. The biological indicators range from Q5 - Q1. Level Q5 denotes a watercourse with good water quality and high community diversity, whereas Level Q1 denotes very low community diversity and bad water quality, as presented in Table 2-1 below.

Table 2-1: EPA Biological Q Rating System

Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2	Bad	Seriously polluted	Unsatisfactory

The EPA online mapping presents the available water quality status information for water bodies in Ireland. Surface water quality is monitored periodically by the EPA at various regional locations along principal and other smaller watercourses. The nearest surface waterbody monitoring station along the subject catchment is situated upstream of the Proposed Development, located c. 200 m to the east of the site (linear distance). This station is known as "GROODY - Groody Br (G1)" (Station Code: RS25G050300) located along the Groody River. However, the most recent Q-value from this station is from 1993, recorded as 'Q3 – Poor – Moderately Polluted'. Upstream of this station, the "Br in Ballysimon (G2)" station (Station Code: RS25G050200) recorded a Q-value of 'Q3-4 – Moderate – Slightly Polluted' in 2021. These EPA river monitoring stations and their most recent Q-values are shown in Figure 2-1 below.

Figure 2-1: EPA River Monitoring Stations (EPA, 2026)

2.1.2.2 WFD Status (2019-2024)

The Proposed Development site is located within the Shannon (International) River Basin District (Shannon IRBD), as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD). According to the EPA maps, the Proposed Development site as defined by the EPA nomenclature (EPA, 2026) is situated in Hydrometric Area No. 25 of the Irish River Network.

The WFD requires 'Good Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring by 2027 at the latest. 'Good Status' means both 'Good Ecological Status' and 'Good Chemical Status'.

Shannon(Lower)_060 WFD river waterbody which includes the Groody River and the River Shannon(Lower) (European Code: IE_SH_25S012600) has a most recent WFD surface water status (WFD Period: 2019-2024) of 'Moderate', indicating a slightly polluted waterbody and its WFD risk score is currently under 'Review'. This rating is attributed to and associated with the presently 'Moderate' ecological and biological status or potential as well as chemistry and nutrient conditions being reported as 'Pass' (www.catchments.ie).

The Limerick Dock Transitional Waterbody is presently classified by the EPA as having 'Poor' WFD water quality status (2019-2024 period) and is 'At Risk' of not achieving good status. This condition is attributed to a poor biological and ecological status or potential, particularly poor fish status or potential, despite high supporting chemical conditions such as good nutrient conditions and high phosphorous conditions (Catchments.ie, 2024).

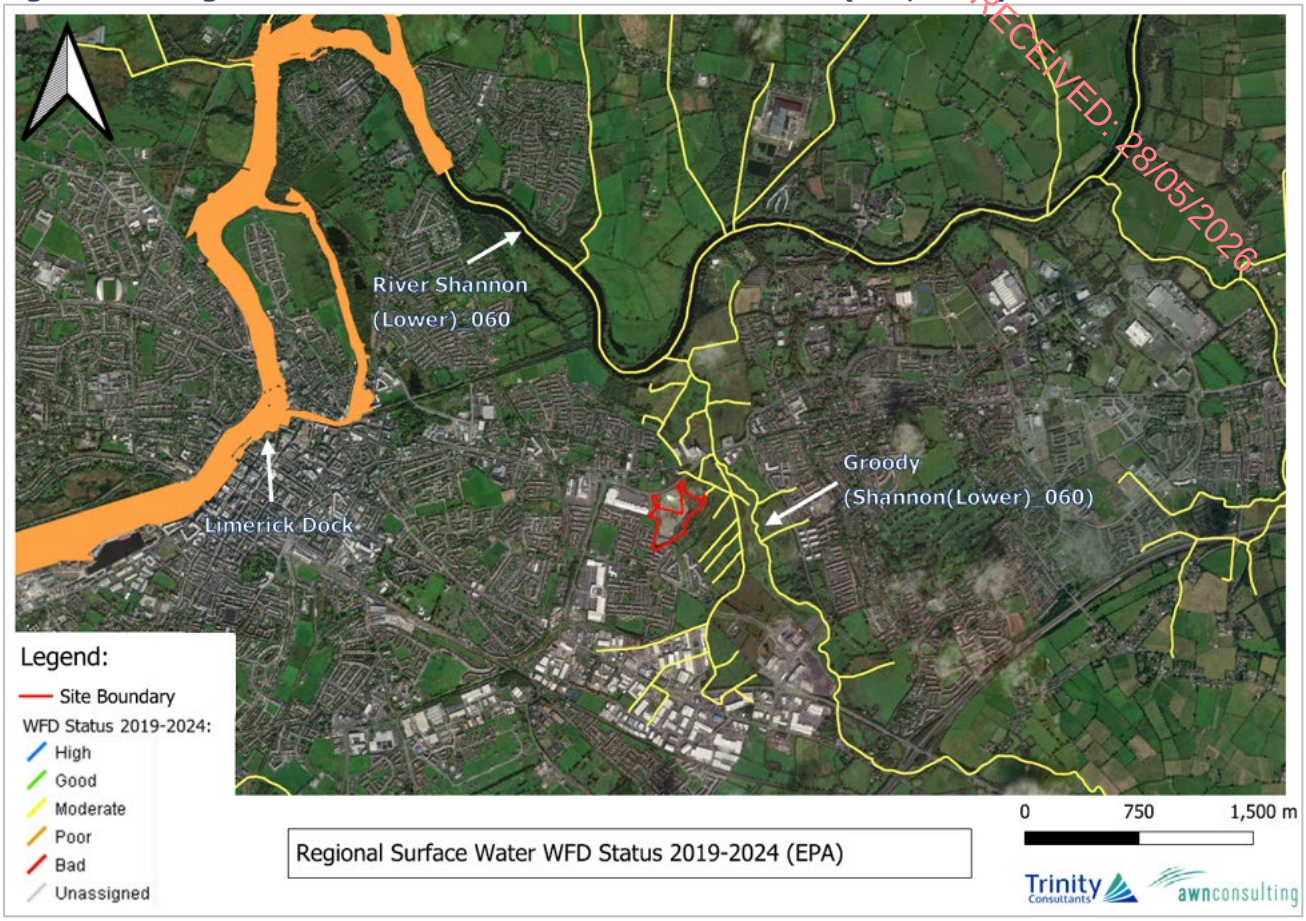
The foul discharge from the site will join the public sewer and will be treated at Limerick WWTP (D0013) prior to subsequent discharge to Limerick Dock transitional waterbody. The effluent point is also located along the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. Therefore, there will also be indirect hydrological connection to the Limerick Dock transitional waterbody and associated deisgnated sites via the foul water discharges from the Proposed Development site.

The WWTP is also underlain by Limerick City Southwest Groundwater Body which currently has a 'Good' WFD status (2019-2024) and is 'At Risk' of not achieving 'Good' status by 2027. The facility is underlain by low permeability estuarine silts and clays (cohesive deposits) and a Locally Important Bedrock Aquifer which is Generally Moderately Productive, classified as having low vulnerability. The effluent is unlikely to impact the status of the groundwater body as it is treated as per the requirements associated with the facility's license. Additionally, there is low likelihood of discharge to groundwater through this pathway due to the low permeability cohesive material underlying the area and the infrastructure associated with the WWTP discharge process. Based on this, the Limerick Southwest groundwater body has been excluded from the linkage assessment discussed in Section 3.

This WWTP is required to operate under an EPA licence and meet environmental legislative requirements as set out in its licence.

The WFD status for the reporting period from 2019 to 2024 is presented in Figure 2-2 below.

Figure 2-2: Regional Surface Water WFD Status 2019-2024 (EPA, 2026)



2.2 Hydrogeological Environment

2.2.1 Superficial Deposits and Bedrock Geology

2.2.1.1 Superficial Deposits

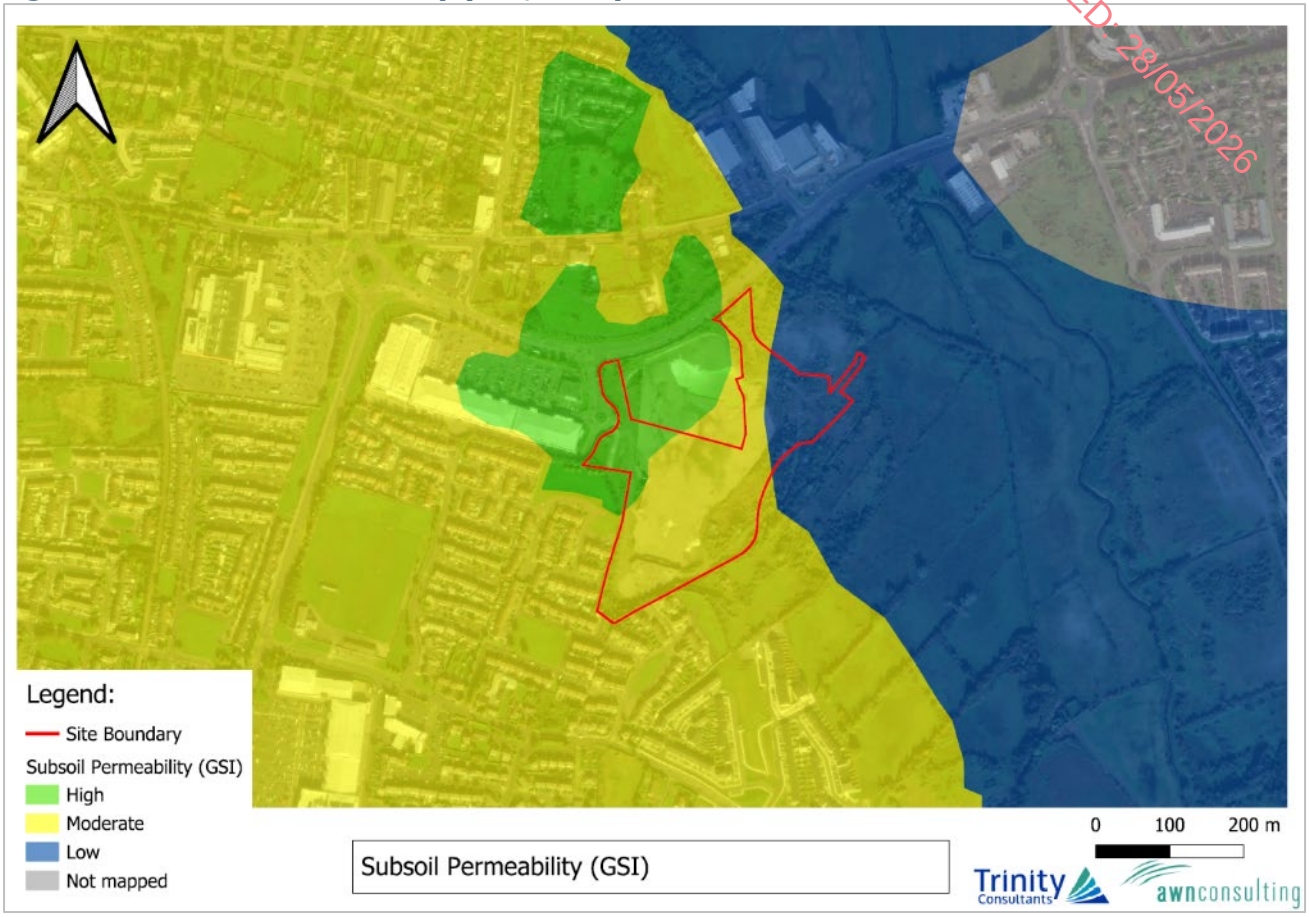
The GSI/Teagasc mapping indicates that there are two soil types underlying the Proposed Development. The western portion of the site is underlain by fine loamy drift derived from limestones, which is classified as a well-drained mineral soil which characteristically supports good permeability and is suitable for a range of land-uses. The eastern portion of the site is underlain by tidal marsh deposits, which are characterized as poorly drained soils which is characteristically frequently saturated due to tidal influence, resulting in anaerobic conditions and high organic matter content.

The GSI/Teagasc database indicates that there are four subsoil types present across the Proposed Development. Gravels derived from limestones (GLs), underlying the north-western portion of the site, which are associated with an area of high permeability. Till derived from basic igneous rock (TBis), underlying the south-western corner of the site which is associated with an area of moderate permeability. Till derived from limestones (TLs), underlying the central and northern portion of the site which is associated with an area of moderate permeability. Estuarine silt and clays, underlying the eastern portion of the site which are associated with an area of low permeability. Figure 2-3 below shows the subsoil permeability underlying the site.

The ground investigation carried out by OCB Geotechnical in 2025 (Report Ref: 25-049) reported that subsoil depths generally range from 3.5 m in the south to 8.7 m towards the north, with bedrock encountered at these depths. The subsoil consisted primarily of made ground to a maximum depth of 3.2

m in the east, 1.8 m in the centre and 1.4 m in the southern portion of the site, cohesive deposits across the site of both silt and clay with glaciofluvial deposits in the north and centre of the site.

Figure 2-3: Subsoil Permeability (GSI, 2026)



2.2.1.2 Bedrock Geology

The GSI (2026) records show the site is underlain by Volcaniclastic Rocks (Rock Unit Code: LTVOLCC) from the Carboniferous and Palaeozoic age bracket. During the site investigation carried out in 2025 by OCB Geotechnical, the bedrock encountered was described as strong micritic limestone, with occasional thin calcite veins and fossil shell debris, and locally interbedded with rare volcaniclastic laminae.

The GSI database does not indicate any geological structural (tectonic) faulting traversing the site or in the immediate vicinity of subject site. There are several bedrock outcrops in the surrounding area of the site, none of which are within the site boundary.

The GSI database presently lists no karst features within the site boundary or in the immediate vicinity of the subject site. The nearest recorded karst feature is the Loughmore Common Turlough, located approximately 7.1 km southwest of the site near Raheen, Co. Limerick (Historic GSI Karst Feature ID: 1415SWK001). This feature is hydrologically upgradient of the site and lies outside the local zone of influence of the aquifer underlying the development area. Therefore, it will not be impacted by the Proposed Development.

2.2.2 Aquifer Classification

The GSI also classifies the principal aquifer types in Ireland as:

Bedrock Aquifer

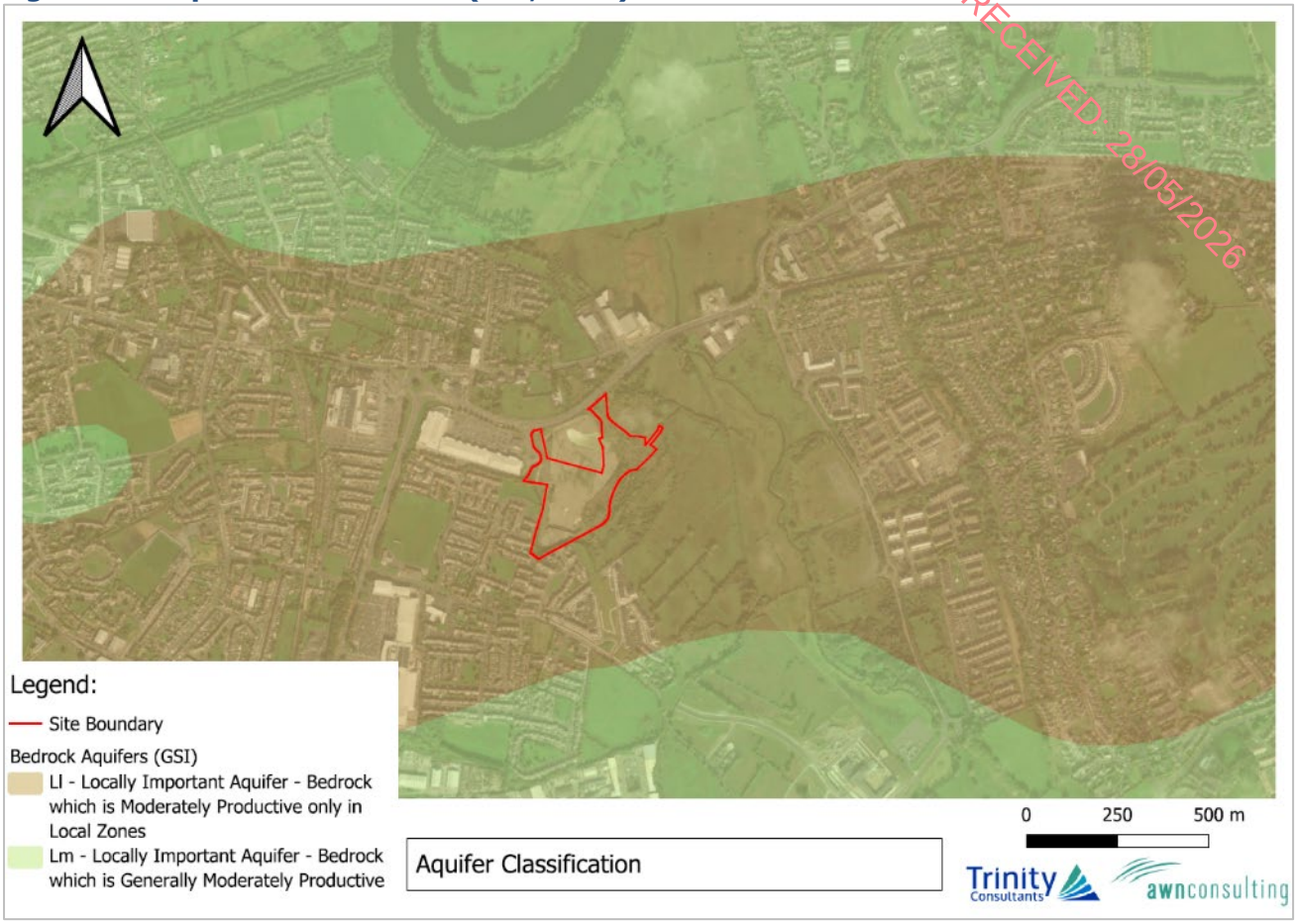
- Rkc – Regionally Important Aquifer – Karstified (conduit)
- Rkd – Regionally Important Aquifer – Karstified (diffuse)
- RK – Regionally Important Aquifer – Karstified
- Rf – Regionally Important Aquifer – Fissured bedrock
- Lm – Locally Important Aquifer – Bedrock which is Generally Moderately Productive
- Lk – Locally Important Aquifer – Karstified
- LI – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones
- PI – Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones
- PU – Poor Aquifer – Bedrock which is Generally Unproductive

Gravel Aquifer

- Lg - Locally Important Aquifer - Sand and Gravel
- Rg - Regionally Important Aquifer - Sand and Gravel

According to the GSI National Draft Bedrock Aquifer Map, the bedrock aquifer underlying the subject site, is classified as a *"Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones"*. This aquifer is capable of supplying locally important supplies (e.g., smaller public water supplies, group schemes). The potential for vertical or horizontal migration within this type of aquifer is not significant and is on a local scale. The aquifer classification for the subject site is presented in Figure 2-4 below.

Figure 2-4: Aquifer Classification (GSI, 2026)



2.2.3 Regional Groundwater Quality

According to the EPA mapping database (2026), the site is located within the Limerick City East groundwater body (GWB) (EU Code: IE_SH_G_138). The underlying aquifer is currently classified by the EPA as having 'Good' WFD water quality status (2019-2024 period) and is 'At Risk' (WFD 3rd Cycle). This condition is attributed to a 'Good' Quantitative Groundwater Status and 'Good' Chemical Groundwater Status (Catchments.ie, 2026).

2.2.4 Groundwater Flow

The flow paths and key characteristics within the Limerick City East GWB can be described as follows:

- Groundwater flow generally occurs along fractures and faults as indicated by the GSI's Limerick City East GWB Report. The local groundwater flow path is from higher ground to the surrounding surface water bodies, where it discharges. The flow of groundwater in this aquifer will be limited to the upper weathered layer in the rock and its orientation and nature dominated by the fracturing of the rock on a local scale.

- The area of the groundwater body is too small to supply regional schemes and is classified as locally important. In this aquifer, groundwater will recharge and discharge in local areas. Recharge in the vicinity is described as diffuse through subsoil and outcrops, and discharge is described as occurring to the local rivers and streams (Limerick City East GWB Report). Groundwater flow is influenced by topography and mirrors the ground levels. Groundwater is generally close to the surface and most groundwater flow is thought to be relatively shallow concentrating in the top 20 m of the rock profile. It is mostly unconfined according to the County Limerick Groundwater Protection Scheme.

The inferred regional groundwater flow would most likely be to the west towards the Limerick Dock Transitional Waterbody. Locally, groundwater is likely to recharge local surface waterbodies, such as the Groody River, due to the local topography and aquifer type.

2.2.5 Aquifer Vulnerability

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Due to the nature of the flow of groundwater through bedrock in Ireland, which is almost completely through fissures/fractures, the main feature that protects groundwater from contamination, and therefore the most important feature in the protection of groundwater, is the subsoil (which can consist solely of mixtures of peat, sand, gravel, glacial till, clays or silts). Extreme groundwater vulnerability is also associated with karst landforms as these are a direct pathway for water and contaminants to enter the aquifer from the surface.

Refer to Table 2-2 below for the Geological Survey Ireland (GSI) aquifer vulnerability ratings, which are based on subsoil permeability, thickness, unsaturated zone characteristics, and the presence of karst features.

Table 2-2: Aquifer Vulnerability

Vulnerability Rating	Hydrogeological Condition				
	Subsoil Permeability (type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/ gravel)	Moderate Permeability (e.g. sandy subsoil)	Low Permeability (e.g. clayey subsoil, clay, peat)	(Sand / gravel aquifers only)	(<30 m radius)
Extreme (E)	0 – 3 m	0 – 3 m	0 – 3 m	0 – 3 m	-
High (H)	>3 m	3 – 10 m	3 – 5 m	>3 m	n/a
Moderate (M)	n/a	>10 m	5 – 10 m	n/a	n/a
Low (L)	n/a	n/a	>10 m	n/a	n/a
Notes: (1) n/a: Not applicable (2) Precise permeability values cannot be given at present (3) Release point of contaminants is assumed to be 1 – 2 m below ground surface					

The GSI currently denotes areas of 'Low', 'Moderate' and 'High' vulnerability across the site, as summarised below:

- An area of 'Low' groundwater vulnerability occurs beneath the eastern portion of the site and extends further east. This classification indicates that the underlying aquifer is highly protected by >10 m of low-permeability subsoil, which significantly restrict vertical water movement. This low vulnerability zone continues into tidal marshland (Teagasc, 2026), providing additional natural protection due to saturated conditions and organic-rich soils that act as a filter for potential contaminants.
- An area of 'Moderate' groundwater vulnerability underlies the central portion of the Proposed Development site. This classification indicates that the underlying aquifer is protected by >10 m of moderate permeability subsoil, typically sandy or silty deposits. These conditions provide a reasonable level of natural protection, reducing but not eliminating the potential for contaminant migration to groundwater. 'Moderate' vulnerability classification underlies the majority of the Proposed Development site.
- An area of 'High' groundwater vulnerability underlies the south-western and western portions of the site. This classification indicates limited natural protection for the underlying aquifer. In the south-western area, the aquifer is covered by approximately 3–10 m of moderate permeability subsoil, including loamy drift, glacial tills, and limestone gravels. In the western portion, protection consists of

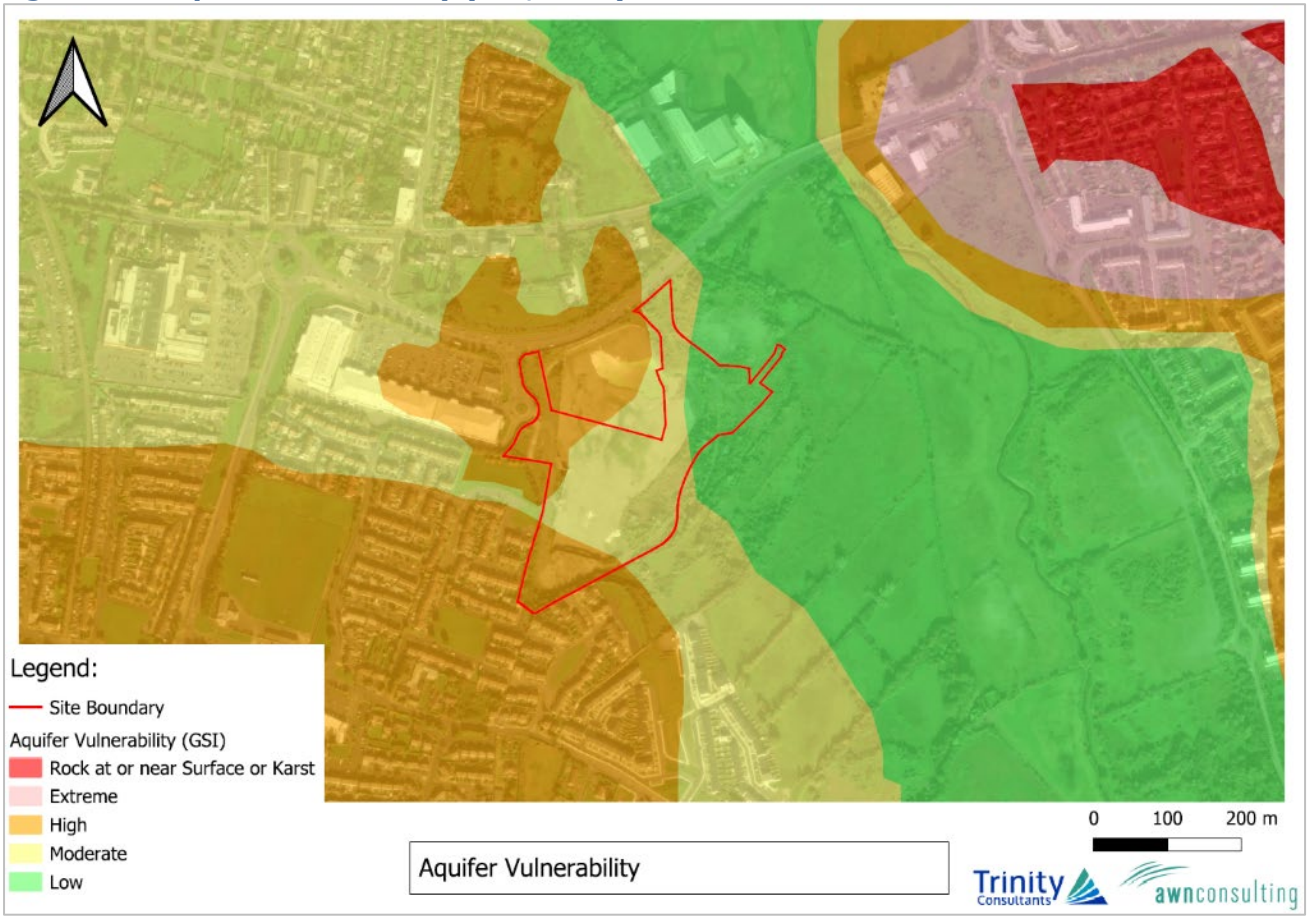
>3 m of high-permeability subsoil, which allows water and potential contaminants to move more easily toward the bedrock.

Site investigations carried out by OCB Geotechnical between July and September 2025 confirmed the thickness of made ground, overburden, and depth to bedrock within areas classified by the GSI as 'Moderate' and 'High' vulnerability. Investigations did not extend into the 'Low' vulnerability zone located in the undeveloped area in the eastern portion of the site. Recorded thicknesses ranged from 4.0-6.5 m in the central portion of the site (RC03 and RC04), 8.7 m in the north (RC02), and 3.5-4.1 m in the southern portion. These findings indicate that the underlying bedrock aquifer is moderately well protected by approximately 5-10 m of made ground and subsoil across most of the site. It should be noted that GSI vulnerability classifications are based on natural ground levels and do not account for areas that have been previously excavated or infilled, which may locally reduce aquifer protection.

Perched water was encountered in the made ground on site, retained by concrete slabs beneath the ground surface. This is not connected to the hydrogeological regime within the subject site.

Refer to Figure 2-5 below for the aquifer vulnerability in the context of the Proposed Development site.

Figure 2-5: Aquifer Vulnerability (GSI, 2026)



3. CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is developed based on a good understanding of the hydrological and hydrogeological environment, plausible sources of impact and knowledge of receptor requirements. This in turn allows possible Source Pathway Receptor (S-P-R) linkages to be identified. If no S-P-R linkages are identified, then there is no risk to identified receptors.

3.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of undertaking the potential of any hydrological/hydrogeological S-P-R linkages, all potential sources of contamination are considered without taking account of any measures intended to avoid or reduce harmful effects of the proposed project (control/design measures) i.e. a worst-case scenario. Construction sources (short-term) and operational sources (long-term) are considered below.

3.1.1 Construction Phase

The following potential sources are considered plausible risk scenarios for the proposed construction site:

i. Hydrocarbons or any hazardous chemicals will be stored in specific bunded areas. Refuelling of plant and machinery will also be carried out in bunded areas to minimise risk of any potential being discharged from the site. As a worst-case scenario, a rupture of a 1,000-litre tank to ground is considered in this analysis which disregards the effect of bunding. This would be a single short-term event.

ii. Leakage may occur from construction site equipment. As a worst-case scenario an unmitigated leak of 300 litres is considered. This would be a single short-term event.

iii. Use of wet cement is a requirement during construction. Run-off water from recent cemented areas will result in highly alkaline water with high pH. As this would only occur during particular phases of work, this is again considered as a single short-term event rather than an ongoing event.

iv. Construction requires excavation of made ground, subsoil, and localised excavation of bedrock for pile installations. Unmitigated run-off could contain a high concentration of suspended solids and contaminants such as hydrocarbons during earthworks. These could be considered intermittent short-term events, i.e. on the basis that adequate control measures which will be incorporated in the Construction Environmental Management Plan (CEMP) fail.

v. Dewatering of the perched water which is within the made ground will be required. However, no significant long-term dewatering is expected as this is not connected to the hydrogeological regime.

With regard to the construction of foundations, piles will be bored displacement (CFA methodology) which will have an average depth of 5 mbgl. This foundation construction method extracts a core of soil and replaces it with concrete cast in-situ; a continuous helical auger drills into the subsoil/rock to the required depth; concrete is then pumped steadily through the hollow stem, forming a continuous cast-in-place concrete pile. Since the core is never left open, CFA piling effectively prevents soil collapse and groundwater ingress. Reinforcement cages are installed immediately after concreting while the concrete remains workable, since the in-situ casting creates a water-tight seal against the geology over the length of the pile.

This methodology ensures that the contact time between the concrete and any potential groundwater is minimal and, given the low connectivity of the underlying bedrock aquifer, this contact is limited to the duration of the concrete seal and spatially, only to the potential groundwater in contact with the hollow stem during this brief period.

Any interaction between fresh concrete and groundwater would be highly localised and short-lived during placement. The surrounding soils and bedrock provide buffering and dilution, and the low permeability means migration beyond the immediate pile location is considered highly unlikely. On this basis, impacts to groundwater quality from piling are considered negligible and this pathway can be excluded.

3.1.2 Operational Phase

The following sources are considered plausible post construction:

i. The Proposed Development does not require any bulk chemical storage and therefore the potential for water quality impact is negligible.

ii. Leakage of fuel may occur from individual cars in parking areas; run-off may contain a worst-case scenario of 70 litres.

Surface water run-off will be directed through the drainage infrastructure which incorporates several SuDS features (see Section 1.4.1.2 above). SuDS features will provide a surface water treatment train and promote source control throughout the development while also providing attenuation storage at source. However, it should be noted that the worst-case scenario (70 litres) under consideration here disregards the effect of SuDS.

Discharge from the site to the public foul sewer will be sewage and grey water only due to the predominantly residential nature of the Proposed Development. The foul discharge from the site will join the public sewer and will be treated at Limerick WWTP prior to subsequent discharge to Limerick Dock transitional waterbody and ultimately Atlantic Ocean. This WWTP is required to operate under an EPA licence (D0013) and meet environmental legislative requirements as set out in such licence.

3.2 Assessment of Pathways

The following pathways have been considered within this impact assessment (presented in Section 3.4):

i. There would be a potential pathway to the underlying aquifer through the bedrock via vertical migration following the proposed localised excavation of bedrock. The bedrock will be temporarily unprotected by any overburden subsoil from any localised diesel/fuel oil spills during construction. The site is underlain by an aquifer which is 'moderately productive in local zones', with a combination of 'low', 'moderate' and 'high' vulnerability across the site. This aquifer is characterised by discrete local fracturing with little connectivity. As such, flow paths are generally local. The potential for offsite migration due to any construction discharges is low as there is no significant pathway in the aquifer.

ii. There is an indirect hydrological linkage for construction and operation run-off from the site to the Groody River (and eventually to the River Shannon SAC) via the discharge of surface water run-off to an open drain which ultimately discharges to the River Groody. The Proposed Development has been designed to incorporate the measures set out in the CEMP during the construction phase as well as SuDS measures during the operational phase. The implementation of these measures will adequately mitigate this impact. However, if these measures were to fail, the potential impact would be slight and short-term.

iii. There will be a pathway for foul sewage through the foul sewer network which discharges to Limerick WWTP prior to final discharge to Limerick Dock transitional waterbody. The effluent point is also located along the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. Limerick WWTP operates under an EPA licence with defined emission limit values and compliance conditions to ensure that treated effluent discharges do not compromise the achievement of WFD environmental objectives in the receiving waterbody.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

i. Underlying bedrock aquifer.

ii. River Shannon SAC (Site Code: 002165) c. 705 m (linear) north of the site.

River Shannon and River Fergus Estuaries SPA (Special Protected Areas Site Code: 004077) is located downstream of the site. However, as mentioned above, the source pathway linkage is over a significant distance allowing for significant attenuation and large dilution factor within the river catchment and estuary. The WWTP effluent point is along the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. The facility is required to operate under a licence which requires that no water exceeding the SI threshold concentrations will be discharged. Therefore, this site was excluded from the assessment due to its distance from the subject site, the potential loading of contaminant from the site (risk scenarios presented in Section 3.1) and significant dilution and attenuation factors through its pathway.

3.4 Assessment of Source-Pathway-Receptor Linkages

There is currently an indirect hydrological connection to the River Shannon SAC. The Proposed Development would have a hydrological linkage through the drainage albeit via a long pathway with significant dilution and attenuation factors downstream in the river network. There will also be a hydrological connection via the wastewater drainage although, as mentioned above, the facility is required to operate under a licence which prevents water exceeding the SI threshold concentrations to be discharged.

The Proposed Development has an indirect hydrological linkage to the Upper Shannon Estuary and its associated Natura 2000 site (mentioned above) via the wastewater network and surface water drainage, albeit the source pathway linkage is over a significant distance allowing for significant attenuation and large dilution factor within the river catchment and estuary.

A cross-section of the site was constructed based on the information available from the site investigation carried out by OCB Geotechnical in 2025. This cross-section is presented in Figure 3-1 below. Table 3-1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk is also summarised below.

3.4.1 Construction Phase

The potential for impact on the aquifer is low based on the absence of any bulk chemical storage on site. Any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak/tank leak will be attenuated and treated through attenuation and hydrocarbon interception on site. No exceedance of water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019) is likely by the time the stormwater reaches the nearest Natura 2000 Sites which would involve a large dilution factor (River Shannon, c. 705 m north downgradient).

As previously stated in Section 2.2 of this report, due to the presence of perched water within the made ground on the site, some dewatering will be required to facilitate construction. This perched water is not associated with the natural hydrogeological regime. No significant long-term dewatering is expected.

3.4.2 Operational Phase

During operation, the potential for a release is low as there are no bulk fuel/chemical storage and no silt laden run-off. Stormwater will be collected by a drainage system which includes SuDS measures and an attenuation system prior to discharge off-site (albeit these measures have been disregarded for this

analysis). In addition, the potential for hydrocarbon discharge is quite minimal based on an individual vehicle (70 litres) leak being the only source for hydrocarbon release. However, even if the operation of the proposed SuDS is excluded from consideration, there is no likely impact on water quality objectives in the worst-case scenarios described above (Section 3.1) and there will be no significant effect on any European site. The volume of contaminant release is low and combined with the significant attenuation and treatment through interceptors on site and within the stormwater drainage network, hydrocarbons will dilute to background levels with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019 at any Natura 2000 sites.

The site is within the urban wastewater treatment agglomeration boundary for Limerick Wastewater Treatment Plant, a licensed WWTP, which will have capacity. Treatment at Limerick WWTP would not impact on the overall water quality within Limerick Dock and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive).

In addition, the future implementation of SuDS features, and standard control measures will ensure that the predicted impacts on the hydrological environment do not occur during the operational phase and that the residual impact will be long-term-imperceptible-neutral. Following the TII criteria for rating the magnitude and significance of impacts on the hydrological related attributes, the magnitude of impact is considered negligible.

The Proposed Development design includes hardstand cover across the site and the surface water drainage system for this development shall be designed as a sustainable urban drainage system and uses attenuations storage, together with a flow control device (hydrobrake), and hydrocarbon interceptors. Therefore, the risk of accidental discharge shall be adequately addressed through design.

All operational cumulative developments are required to manage discharges in accordance with S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. Therefore, the in-combination effects of surface water arising from the Proposed Development taken together with that of other permitted developments will not be significant based on the in-combination low potential chemical and sediment expected loading. As such there will be no cumulative impact to surface water quality and no cumulative impact on the Surface Waterbody Status as a result of the Proposed Development in combination with other existing, permitted or Proposed Developments. The operation of the Proposed Development is concluded to have a long-term, imperceptible significance with a neutral impact on surface water quality.

Therefore, based on the loading considered in the worst-case scenarios mentioned in Section 3.1 above during construction and operation phases, there is subsequently no potential for impact on downgradient Natura 2000 habitats.

Figure 3-1: Cross-Section A-A'

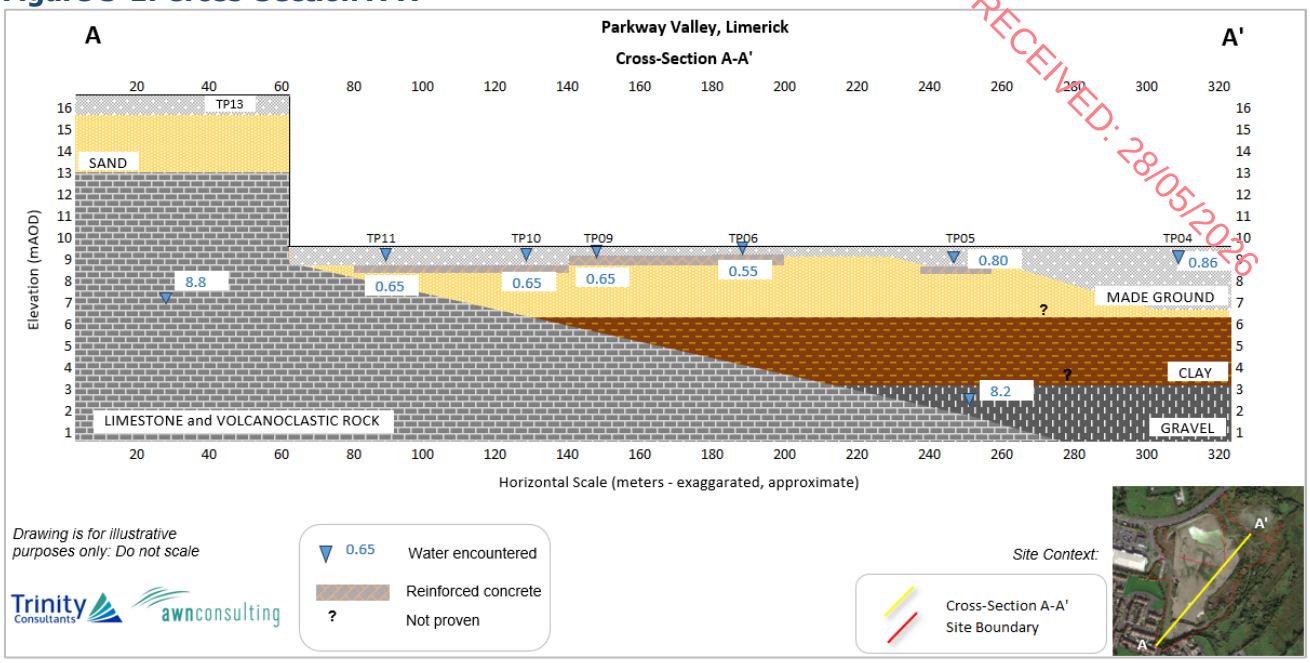


Table 3-1: Pollutant Linkage Assessment (without control measures)

Sources	Pathways	Receptors	Risk of Impact
Construction Impacts			
Unmitigated leak from an oil tank to ground/ unmitigated leak from construction vehicle (1,000 litres worst case scenario).	Pathway to the underlying aquifer as excavation occurs during construction. This aquifer is characterised by discrete local fracturing with little connectivity rather than large, connected fractures which are more indicative of Regional Aquifers. As such, flow paths are generally local.	The aquifer underlying the majority of the site is classified by the GSI as bedrock which is Moderately Productive only in Local Zones (Ll). The subject development site is not underlain by any gravel aquifers.	Low risk of migration through poorly connected fracturing within the limestone (Locally Important Aquifer) rock mass. No likely impact on the underlying aquifer due to low potential loading, natural attenuation within overburden and discrete nature of fracturing reducing off site migration.
Discharge to ground of run-off water with High pH from cement process/hydrocarbons from construction vehicles/run-off containing a high concentration of suspended solids	Discharge of surface water run-off to the River Shannon (Lower) waterbody	River Shannon SAC (located 1.4 km downstream, hydrological distance)	The Proposed Development has been designed to incorporate the measures set out in the CEMP during the construction phase as well as SuDS measures during the operational phase. The implementation of these measures will adequately mitigate this

Sources	Pathways	Receptors	Risk of Impact
			impact. However, if these measures were to fail, the potential impact on the SAC and associated surface waterbodies would be slight and short-term with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019.
Operational Impacts (Summary)			
Foul effluent discharge to sewer	Pathway through foul sewer to Limerick Dock waterbody and associated Natura 2000 Sites via Limerick WWTP	River Shannon SAC (located 0 m downstream of the WWTP). River Shannon and River Fergus Estauries SPA (located 0 m downstream of the WWTP).	No perceptible risk – Foul discharge is to a licenced WWTP which has capacity. Treatment at Limerick WWTP would not impact on the overall water quality within Limerick Dock waterbody and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive).
Discharge to ground of hydrocarbons from carpark leak (70 litres worst case scenario)		River Shannon SAC (located 1.4 km downstream, hydrological distance)	

Sources	Pathways	Receptors	Risk of Impact
	Pathway through stormwater drainage to River Shannon (Lower) waterbody & the downstream Limerick Dock Transitional waterbody, Upper and Lower Shannon Transitional waterbody and associated Natura 2000 sites		No perceptible risk – taking into account the extent of loading of contaminant, distance between the source and nearby receptor and treatment on site. No likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019.

4. CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desk top review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. control/design measures) in place at the Proposed Development site.

During construction and operation phases there is a source-pathway linkage between the Proposed Development site and River Shannon SAC (located c. 705 m to the north, 1.4 km hydrological distance). However, there is no potential for exceedance of water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019) as there will be attenuation and treatment on site during construction and operation.

There is no direct source pathway linkage between the Proposed Development site and any Natura 2000 sites (i.e. River Shannon and River Fergus Estuaries SPA). There is indirect source pathway linkage from the Proposed Development through the surface water drainage design which discharges into an open drain which flows into the Industrial Estate/Galvone Stream, ultimately discharging to the Groody River and eventually to the River Shannon (Lower).

Even disregarding the operation of SuDS measures to be designed, it is concluded that there will be imperceptible impacts from the Proposed Development to the water bodies due to emissions from the site stormwater drainage infrastructure to the wider drainage network. It should be noted the proposal will also include and employ control measures which serve to provide a degree of attenuation and hydrocarbon interception as part of best practice project design.

The proposed piling methodology ensures that the contact time between the concrete and any potential groundwater is minimal and, given the low connectivity of the underlying bedrock aquifer, this contact is limited to the duration of the concrete seal and spatially, only to the potential groundwater in contact with the hollow stem during this brief period. Any interaction between fresh concrete and groundwater would be highly localised and short-lived during placement. The surrounding soils and bedrock provide buffering and dilution, and the low permeability means migration beyond the immediate pile location is considered highly unlikely. On this basis, impacts to groundwater quality from concrete works are considered negligible.

According to the 2024 Annual Environmental Report (AER), the WWTP currently has adequate operational capacity to accommodate the additional flows generated by the Proposed Development. As such this flow would not have a measurable impact on the overall water quality within Limerick Dock transitional waterbody and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). Furthermore, the Proposed Development will not contribute any additional stormwater drainage to the WWTP.

It is concluded that there is a low pollutant linkage as a result of the construction or operation of the Proposed Development will not result in a significant water quality impact which could alter the habitat requirements of the Natura 2000 sites within and associated with Limerick Dock transitional waterbody.

5. REFERENCES

- EPA, (2026). Environmental Protection Agency. Available on-line at: https://gis.epa.ie/EPAMaps/.
- GSI (2026). Geological Survey of Ireland; Available on-line at: http://www.gsi.ie.
- NPWS (2026). National Parks & Wildlife Service. Protected Site Register. Available on-line at: http://webgis.npws.ie/npwsviewer/.
- River Basin Management Plan for Ireland 2018-2021.
- River Basin Management Plan for Ireland 2022-2027.
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW)).
- Office of Public Works (OPW) flood mapping data (www.floodinfo.ie).
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA 532, 2001).